THE

JOHNS HOPKINS HOSPITAL

BULLETIN

VOLUME V.

THE FRIEDENWALD COMPANY,
PRINTERS.

CONTENTS.

PRIMITIVE TREPHINING, ILLUSTRATED BY THE MUÑIZ PERUVIAN COLLECTION.

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[*Presented to the Historical Club, December* 11, 1893.]

The aboriginal culture of the Western hemisphere culminated in the central portion of that hemisphere, the peoples of highest status being distributed over Mexico, Central America and the northern portion of South America. In some respects the most highly cultured aborigines were those of the territory now embraced in Peru. The native genius of the South American Indians, fertilized by the intelligence of the mysterious Manco Capac and his consort, bore fruit in one of the most remarkable cultures recorded in history. The ancient Peruvians were tillers of the soil, miners and quarrymen, weavers and wearers of stuffs, growers and millers of grain, and among their numbers were civil engineers whose acequias and roadways yet remain, astronomers with elaborate devices for determining the solstices, and designers of noble architecture. This remarkable status of the ancient Peruvians is constantly to be borne in mind in the study of their works.

The operation of trephining for the relief of cranial fractures, intercranial tumors, epilepsy, etc., is well known, and Broca, Prunières and others in Europe, as well as Fletcher and a few other students in this country, have shown that the operation was performed commonly post-mortem, but sometimes ante-mortem, by prehistoric peoples. Moreover, trephining is known to be performed among various primitive

peoples, notably the South Sea Islanders, whose methods are quite primitive (the instruments being of stone, and later of broken glass when this commodity was introduced), and among the Kabyles of northern Africa, by whom the operation is performed in a primitive manner with rude metal instruments. While the primitive operation is sometimes surgical, it sometimes represents the mystical "medicine" of the uncultured mind, *i. e.*, it is designed to exorcise or extract an evil spirit; and it appears that among prehistoric peoples the post-mortem operation was performed to yield "rondelles" or buttons to be used as amulets or charms, these buttons being taken from the skulls of persons who had suffered trephining in early life, probably during youth.

Thus the operation of trephining may be classed in various ways: by period, as historic and prehistoric; by the character of the operation, as cultured or primitive; by relation to the individual, as ante-mortem or post-mortem; and by function or purpose, as surgical or thaumaturgic. In some respects the classes resting on the different bases correspond; *e. g.*, the prehistoric trephining was exclusively primitive, largely ante-mortem, and chiefly or wholly thaumaturgic; but it is to be remembered that the correspondence is not complete. So while it is opined that the crania in the Muñiz collection represent primitive trephining, and that a part of them indicate

and seemingly demonstrate that the operation was surgical, and hence ante-mortem, it is not denied that the work may have been in part thaumaturgic; and no opinion is expressed concerning the period during which it was done, except in so far as a prehistoric period would seem to be implied by the primitive character of the operation.

The Muñiz collection was brought together by Señor Manuel Antonio Muñiz, M. D., Surgeon-General of the Peruvian army. It comprises 19 specimens representing the trephined portion of a collection embracing about 1000 skulls. Five specimens come from the vicinity of Cuzco, 11 from Huarochiri and the neighborhood, and 1 each from Tarma, Pachacamac and Cañete. This material thus represents a considerable area. The collection was brought to this country for exhibition at the World's Congress of Anthropology held in connection with the Columbian Exposition at Chicago, and has been placed in the custody of the Bureau of American Ethnology for publication. Two of the crania remain in this country, one in the Bureau above mentioned and the other in the Army Medical Museum; the remaining 17 will shortly be returned to Lima to be preserved in the Museum of the Peruvian Geographic Society.

The 19 specimens may be arranged in such order as practically to tell their own story. About half are of interest chiefly as indicating the manner in which the operation was performed. Three types of operation are exemplified.

In the first type four linear incisions were made in the cranium in parallel pairs intersecting each other at right angles so as to form a rectangular button; the incisions being narrow, v-shaped in cross section, and gradually increasing in depth from ends to center, thus indicating that the instrument was a pointed bit of stone or arrow-head held vertically and operated by reciprocal motion. This suggestion gains strength from the fact that American Indians are known to have produced incisions in bone in this fashion. This type of operation is rude and the resulting traumatism is jagged, each incision extending perhaps half an inch beyond the button at each extremity. There is no indication of the purpose of the operation of this type in any case, and nothing to suggest that if the operation was ante-mortem the individual survived. Aberrant examples of this type exhibit three or more parallel incisions, one example consisting of three approximately parallel incisions in each of the two rectangular sets forming a quadruplicate button or four coincident rectangles of which one remains, the other three being completely removed; and in another example the incisions of the rectangular system are still more numerous, and there are some oblique incisions, nearly four square inches of bone being removed and no fewer than 20 distinct incisions showing about the margin of the aperture.

In the second type of operation the incision was evidently made also by a rudely pointed instrument, probably of stone, held vertically and moved reciprocally; but as the cutting reached and penetrated the inner table, the locus of incision was moved forward and at the same time the direction of the sawing was changed so as to produce a rudely curved cut and, when two such incisions were made, an irregularly elliptical button. Some examples indicate that this type of operation was completed by scraping or grinding away the jagged surfaces left by the incision.

The third type of operation was performed largely or wholly by scraping in such manner as to remove the outer table and diploë and reduce the inner table to a feather-edge. Some of the examples suggest that the scraping, which may easily have been effected with stone instruments and gives no indications of the use of metal, represents the final part of an operation begun by the curved incision.

Several specimens show by spicules of reparative growth and by the partial absorption of the outer table and diploë that the patient survived the operation, and hence that the trephining was ante-mortem. One individual appears to have long survived an operation forming a rudely circular aperture about three-quarters of an inch in diameter in the posterior portion of the cranium, and probably also for a short time a similar operation involving the metopic suture (which in this case is distinctly preserved). Another individual long survived two operations, probably of the second type, giving apertures nearly an inch in diameter, but apparently died about the time of the completion of a third trephining involving the coronal and sagittal sutures. A third individual long survived, as indicated by the reparative spicules and the complete absorption of outer table and diploë, an operation by scraping giving a rudely circular aperture about an inch in diameter. In none of these cases is the purpose of the operation evident.

One specimen exhibits an operation of the first type remarkable for the small area involved. Although the skull is fully quarter of an inch thick, the parallel incisions are not more than three-eighths of an inch apart. In this example the surrounding bone exhibits a spongy texture indicating a diseased condition; and it seems possible that the operation was designed to relieve attendant symptoms after the manner of the primitive "medicine" of the American Indians, e. g., by liberating an evil spirit; if so, the trephining in this case was thaumaturgic, and the example is noteworthy as the only one suggesting thaumaturgy.

Several examples are exceptionally noteworthy in that they prove the operations to have been surgical. In the first example the cranium shows a depressed fracture of the left temple, such as might have been produced by impact of a sling-stone or blow from a spiked club, which are known to have been the weapons used among the ancient Peruvians. An operation essentially of the first type was begun, but only three incomplete incisions were made and the button was not removed when the work was discontinued, probably by reason of the death of the patient. The second example shows marks of a similar fracture in the posterior portion of the left parietal; in this case four incisions of the first type (although one is oblique) were made, and the operation was carried far enough to remove the button, but not the jagged edges resulting from fracture and operation, this individual also apparently dying in the hands of the operator. A third specimen displays a compound fracture involving the left temporal suture; and in this case an operation was performed by scraping, producing

an elliptical aperture about five-eighths by three-quarters of an inch; and there is in addition a simple vertical incision such as those produced in the first type of operation, which apparently represents the first stage of supplementary treatment. This individual also apparently died before the final operation was completed. Another example exhibits a linear fracture fully six inches long, extending from near the center of the occipital across the lower portion of the right parietal and across the temporal, disappearing under the zygomatic arch. The treatment in this case consisted of scraping at several points along the fracture, including a scraped trephining, yielding an aperture of about three-eighths of an inch in the occipital bone not far from the termination of the fracture. This operation would appear to have been completed to the satisfaction of the surgeon. Then, as indicated by the condition of the specimen (a mummy in which a considerable part of the scalp is preserved), the scalp was laid open over the occiput and two incisions representing an operation of the first type, together with a minor vertical cut, were partially completed before treatment was finally abandoned, apparently by reason of death. Thus, while it can hardly be said that these four examples demonstrate the ante-mortem date of the operation, since it is just conceivable that they might represent post-mortem exploration, they nevertheless prove that, if ante-mortem, the operation was surgical; and the ante-mortem date of the operation in some cases is proved by examples already noted.

One of the specimens is of exceptional interest in several ways. The skull is small and thin; the anchylosis of the sutures is so far progressed as to indicate an age of twenty-five or perhaps thirty years; while the development of the teeth indicates an age not exceeding twelve years. In this case the aperture, which is on the right side, is of remarkable size, extending from the frontal within three-quarters of an inch of the orbital cavity across the coronal suture nearly to the center of the parietal, its length being fully four inches and the width averaging an inch. The specimen is of interest also in that it was the only one in which a plate is known to have been used, a silver plate having been found in place over the aperture in the mummy case. The presence of the plate, its seat in the skull showing long wear, and the absorption and reparative growth, all indicate that the operation was survived. No wound appears in the vicinity of the trephining, but there is a traumatic depression on the left side of the frontal an inch and a half above the orbital cavity and about the same distance from the center line, apparently due to a blow, such as produced the depressed fractures in other examples, suffered in early life when the bone was soft. Now, while the operation cannot directly be traced to this traumatism, it is suggested that this wound produced the abnormal, perhaps epileptic, condition which is indicated by other characters of the skull; and that the enormous trephining represents successive operations designed to relieve this condition. If these inferences be true, it will follow that the operation in this case was not only surgical, but parallel with the non-traumatic trephining of modern practice, thus indicating a considerable advance in medical knowledge and surgical skill.

On the whole, the Muñiz collection, which is by far the largest and most instructive assemblage of specimens of primitive trephining thus far brought together, is of special note in that it demonstrates certain points heretofore obscure with respect to primitive trephining. The most important conclusions are: (1) That the operation was ante-mortem, since five individuals out of the nineteen represented certainly, and two or three more probably, survived one or more operations; and (2) that the trephining was surgical. Two provisional conclusions of importance are also indicated by the collection: (3) that the operation was used in a medical way to relieve a general pathologic condition; and (4) that the operation was, as indicated by the total absence of marks of metallic instruments, anterior in date to the Spanish invasion and thus essentially prehistoric.

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THE WORKS OF JUSTINE SIEGEMUNDIN, THE MIDWIFE.

BY HUNTER ROBB, M. D., *Associate in Gynecology.*

[Read before the Johns Hopkins Hospital Historical Club, November 13, 1893.]

It was proposed to me last year that I should take up the works of the French midwives, or I should rather say of one or two of the more important ones. It is but natural that after reading the works of Madame Lachapelle and of Louyse Bourgeois we should be interested in seeing what progress had been made by their sisters in the art in Germany; and so before taking up the study of the works of Madame Boivin, it

FIG. 1.

An Gottes hilff und Seegen
Geschickten Hand bewegen
Ist all mein Tuhn gelegen.

FIG. 2.

seems advisable to consider in brief the life and writings of the most celebrated of the German midwives of the 18th century, namely Justine Siegemundin. The edition, which has been kindly lent to me by Dr. Kelly, was published in Berlin in 1756. The title of the book in brief is:—"The Midwife of the Royal Family of Prussia, and of the Family of the Kurfürst of Brandenburg." Let this suffice for our present purpose, although the title-page gives us much further information to which we will refer later (*vide* Fig. 1). As a frontispiece we have the portrait of the authoress, with the quaint legend beneath: "An Gottes hilff und Seegen Geschickten Hand bewegen Ist all mein Tuhn gelegen." "All my doing depends on God's help and blessing, and on the skilful motions of my hands." (*Vide* Fig. 2.) This sentiment is the

keynote of the whole work. Justine Siegemundin is nothing if not pious. In order to avoid all unnecessary repetition we may say once for all that, not content with beginning her work with a verse from Exodus referring to the blessings which came upon the faithful Hebrew midwives (a verse, by the way, which for fear of possible misinterpretation she kindly explains), she interlards it at almost every line with a pious sentiment, giving God the glory for all the good she has ever been able to perform, and holding herself up as a special instrument in the hands of God for the performance of a very important work. So much, then, for her piety, and we deem ourselves not only worthy of pardon, but also of some gratitude on the part of our hearers if we refrain from the vain repetitions through which we ourselves have waded, not without some weariness of spirit.

The prefaces to the book are two in number. The subject of the first she states as follows: "The circumstances which led me to take up this calling and science." "My reason for undertaking to write this book of instructions, and my end and aim in doing so." From the kindly way in which, as she herself acknowledges, she was at first received by the midwives,

we might have been led to believe that she had no enemies, and yet the preface at the very beginning has the appearance of a polemic. Some had objected that women who had had no children were necessarily unfit to treat difficult cases of childbirth. "Can," she asks, "we expect a physician to first undergo in his own person all the various grievous maladies before we consider him competent to properly treat the same in the persons of others?" Again, "Might not a woman who had borne many children with normal labors stand aghast when some abnormal case came in her way as a midwife; or can a woman during a hard labor, distracted as she is by pain, appreciate what is going on in her own body better than a scientific midwife, even though the latter has never experienced the pain herself?"

Her account of how she became a midwife we will give only in brief. Her father died when she was a child, and she was brought up by her mother, of whose training she speaks in high terms. At the age of seventeen she was married to a man who held some petty government office in a small town in Silesia. In her twenty-first year she was held by the midwives to be pregnant. The diagnosis of a normal presentation was made, and as she naively says, "Because I did not know any better than what was told me, I was in labor until the third day without being delivered. One midwife after another was sent for until four were present, who all agreed that the presentation was good (although no child appeared). So I was compelled to suffer torture for fourteen days, and was kept as it were upon the martyr's bench, and should have given up the ghost sooner than have brought forth a child. The final decision of the midwives was that I must die with my child, but determined as they were in their wisdom that I should bring forth a child, yet I bore none. But God had mercy upon me and sent to the village where I lay a soldier's wife. This woman was summoned, and having more understanding than the midwives, she decided that there was no question of a child, but that I had a stoppage of the blood and a mighty sickness with a falling of the womb. Upon this a physician was sent for, and under God's blessing soon restored me." Her own danger seems to have excited her interest in the subject, and from that day she began to study midwifery, but without any intention of practising it. Strange as it may seem, however, the midwives soon began to call her in consultation, and for twelve years she practised her art among the poorest classes of peasant women without receiving any fee. Finally she was called to attend the wife of a clergyman, and later, without the expression of any wish on her part, she was appointed midwife of the city of Liegnitz. On the recommendation of several physicians, she was called in to see a lady of high rank who had a tumor of the womb, and had—shall we say?—the temerity to remove it by means of a fillet. The operation is explained in her book by copper-plate engravings. The prince then gave her a settled position with a fixed salary, and it became her duty to follow the court. In this capacity she was called sometimes to Saxony, at other times to Silesia and to various other places. In her travels she met with many distinguished physicians. Finally the Kurfürst Friedrich Wilhelm appointed her court midwife, in which position she was confirmed by his successor, Frederick III. She was in the

habit, when attending cases, of taking notes, partly to beguile the time and partly because she thought that the notes from one case might stand her in good stead should a similar difficult case arise. On studying her notes further questions would arise, which she discussed with other midwives and doctors. Finally she was asked to publish her observations, but it was not until the entreaties of the Queen of England had been added to those of the Kurfürst and of the Princess of Nassau, not to mention those of various eminent physicians and others, that she yielded. This work, then, as a childless woman, she would leave as her child to posterity. The book was published at her own cost, and in order to make it of more practical use she has taken pains to adorn it with copper-plates in order to illustrate the instructions contained therein. Dealing more especially with abnormal labors, she has yet thought it best to give a diagram which represents the foetus *in utero* in a normal case. The placenta also and the different membranes are diagrammatically shown.

She goes on to prove the necessity for such a book, and from what she says it would appear that when the midwives met together and related their experiences and detailed the different cases in which they had either been successful or unsuccessful, or again spoke of those which they had been induced to leave to God and nature, she questioned them somewhat after the Socratic method, and being equally successful with Socrates in gaining for herself unpopularity thereby, discovered that most of them had no idea of normal presentations, much less of the necessity of turning under certain circumstances. Nor did they understand the method of carrying on such an operation.

She defends the simplicity and unpretending style of her work by saying that she wishes to write a text-book which can be read with interest by those who understand the precepts which it teaches, and which at the same time will not be above the comprehension of those who are not so well instructed. She closes her preface with two certificates, the first from the court preachers, and the second from the dean and professors of the University of Frankfurt-on-the-Oder, both of which bear witness to the fact that the work was indeed her own, and that after a careful perusal of it these high authorities had deemed it worthy of publication.

The second preface, written by the assessor of the College of Medicine in Berlin, a certain J. D. Gohl, and edited in 1723, treats of the qualifications of a midwife. "The first thing necessary for a good midwife is that she possess the fear of God, from which will spring all other qualities. It is not enough that she escape all scandal, but she must herself know the path of penitence, in order that she may be able to associate not only with those who, like all mortals, bring forth children in sin, but with those also who conceive and bring forth children without the countenance of the ordinary laws. If she be not God-fearing she is liable to yield to the temptation to shield those who are unwilling that their godless deeds should come to light. Furthermore, she will be a slave to avarice and will sell herself for money. There is a dreadful story of a midwife in Paris, named Constantine, who made a criminal house out of her abode, and took in those who wished to have abortions performed upon them. Odile Paillard car-

that this woman was finally convicted in 1660 of causing the death of a young woman by her illegal methods. Six hundred witnesses testified that they had also aborted in her house. From such evil deeds only the grace of God can protect the midwife. A suitable woman is hard to find, because so many, even when God-fearing, are stupid. Still, only if she has a conscience will she be honest and recognize her own shortcomings." The writer goes on to say that women who are given to drink, from which proceed carelessness and laziness, are not fit to be midwives, and adds: "But besides being God-fearing and honest, the next necessary for her is that she have instruction; and first of all, a woman intended for the profession of midwife must absolutely know how to read, in order that she may be able to learn from the experience of others and not trust to blind chance. She must understand of anatomy as much as deals with the female genitalia, conception, gestation and labor. On the last-mentioned point the older midwives have held such nonsensical ideas that they cannot now be mentioned. It is necessary that she obtain information as to these points either from demonstrations on the dead body or from lectures. Friedrich Wilhelm has arranged that such instruction should be given to midwives by women of the same profession, and where the efforts of these do not suffice they are to be supplemented by those of the surgeons. Even a slight knowledge of anatomy will do away with many false ideas held by former midwives, who believed that the uterus wandered around in the body; but a more thorough knowledge will enable them to foresee and prevent complications. This knowledge can only be obtained in two ways, either the midwife must be the daughter of a midwife and be instructed by her mother, or she must go to a skilled midwife for instruction. In the country, then, it is the duty of the magistrate either to provide a midwife who has been instructed in the larger cities, or to choose women who can read and who are the daughters of midwives themselves. No woman should be accepted for such an office before having undergone an examination, and the most fitting examiners are the surgeons. Such women are recommended to read this book of Justine Siegemundin. The most important point, perhaps, is that they should understand abnormal presentations, in order that they may be able to recognize them and to rectify them by *turning in time*. For if the fear of God and a knowledge of reading be lacking, it will go hard not only with the midwife, but with the mother and child; and the midwife who recklessly tears away a child must be held to have performed a godless work. Such incompetent midwives must be looked upon as privileged murderesses, and those who have shown me an arm that has been torn away to prove to me how hard the labor was, I have suspended from their office. It is one and the same thing whether one robs of life a being already born, or whether through ignorance or carelessness one prevents a child from coming into the world alive. If Justine has not spoken of the medicines which should be given, it is because in the large cities this should be left to the doctors; but midwives practising in the villages should make themselves acquainted with certain sound domestic remedies." With this end in view, the writer recommends to their reading a little book written by Johann Silticks, as containing comforting

instructions for pregnant or parturient women, of which he gives extracts, and closes the preface with words of praise for the present work.

Now we come to the book itself. It is divided into two parts. The first is a discourse on the subject of difficult labors and how they are to be met, and also on the right method of turning in abnormal presentations. Both are arranged in the form of a conversation between two midwives, and in the second Justine and Christina are represented conversing together in order to find out whether Christina has rightly understood and grasped the instructions of Justine. At the end of the book comes a treatise on medicines, and finally, papers referring to the dispute which had arisen between Justine and Dr. Andreas Petermann, who had characterized many of her teachings as vain speculations.

Justine recognizes three presentations. First, the presentation of the head (the normal presentation), a second of the feet, and a third of the breech. She says that if the presentation is not normal and the midwife does not understand turning, it is only under exceptional circumstances that both the child and the mother survive. She begins with a statement of first principles. "Every woman who conceives must have a uterus; besides this there is the vagina, which leads to it, and the cervix which is the entrance to the womb in which the child is conceived, carried and retained until, unless a mishap occurs, it comes forth into the world. If a woman has pains and the cervix be not opened, and if the pains cannot be quieted, medicine must be given so that the fœtus may be retained. When, however, the pains go on increasing and the cervix opens, this is a sign that the pains are true labor pains." "What shall we do then," says Christina, "if a woman is in labor a whole day and the cervix be not opened?" "This happens only," says Justine, "in primiparæ, and if the cervix dilates but slowly, two fingers should be inserted to hold the womb back, for it is in such slow cases that prolapsus of the uterus is wont to occur. Many unskilled women, not knowing the existence of the cervix, and not understanding how the child comes forth, fail to protect it from tearing during labor. That the cervix is so often not found is due to the fact that it frequently is situated pointing to the rectum."

She devotes a whole chapter to the discussion as to whether or not during labor the pubic bones are separated at the symphysis, and after deciding in the negative, continues by saying that tedious labors are produced among other causes, by the catching of the head on the pubic bones. She attributes tedious labors above all to the will of God, but states the natural causes to be (1) the want of yielding of the cervix; (2) the inclination of the cervix backwards, or because the fœtus does not descend, a common occurrence where the abdominal walls are flaccid; (3) because the child's head does not present in the middle. This last is seen in Plate B (*vide* Fig. 3). Plate C shows the head directed to one side and the child lying on its back (*vide* Fig. 4). She holds that sometimes, however, the child will be born in the occipito-posterior position, as shown in Plate E (*vide* Fig. 5), although this is a much more difficult labor than when we have an occipito-anterior presentation. These and a somewhat oblique presentation she has often remedied by the timely rupture of the

Fig. 3.

Fig. 5.

Fig. 4.

Fig. 6.

bag of waters, but she insists that if the presentation becomes transverse, nothing is left but turning. If the child presents well but the shoulders are too large, she recommends making traction with a finger in each axilla. Plate H shows a face presentation with the chin posteriorly; this she calls an abnormal and a dangerous presentation (Fig. 6). She says that it is often caused by violence, such as jolting in a wagon, and that she has proved this by making examinations before and after such an occurrence. In these cases she endeavors to bring down the occiput. She lays stress upon the importance of the signs to be gathered from the cervix in distinguishing between true and false labor pains, and she insists upon a careful preliminary examination by which at the same time we can determine the presentation. She deprecates a too hasty resort to stimulation of feeble pains, even in cases where the head is large. She has often been called to see such cases after the child was dead, and has had to extract it by means of a blunt hook, of which she gives a picture. On one occasion the skull broke as she was extracting it, but she was warned in time, because she had the fingers of the other hand on the child's head. She recommends the midwife when first called to stay with the woman during five or six pains and then to leave the room, but to enter it again as soon as the severe pains come on. "You can leave the woman in her bed until that time, for the head can be directed while the woman is in bed as well as when she is on the labor stool. Sometimes it will be well to allow the woman to walk about, but she ought not to be allowed to stand after the cervix is fully dilated."

Chapter IV gives an account of abnormal presentations, and refers to the treatment with especial reference to the operation of turning. She treats first of the presentation of the arm or hand, giving an illustration of the same. In her first case of this kind the position had been maintained for fourteen hours, and she found half the arm with the hand protruding from the body. The woman had been in labor three days. The midwives had consulted the books and diagrams, but had been unable to decide to which kind of presentation the present one belonged. "I was 23 years old at that time." (Justine takes advantage of this case to relate that of her own supposed pregnancy.) "On being summoned and making an examination, I pushed back the hand, having smeared it over with warm beer and butter." This procedure was followed by a normal birth, the child being alive. She confesses that she did not quite understand why her manipulations were successful, but conjectures that the head of the child was caught against the pubic bone, and it was not until the arm was replaced that it could descend. This successful operation not only gave her experience, but by reason of it she was always invited afterwards to difficult labors. The whole chapter in which she treats of such presentations, and of the indications for and the methods of employing external and internal version, is excellent.

After Justine has given these cases and referred to the 33 plates, Christina is not satisfied and asks in which of the positions represented is turning indicated, or in which it has already been performed. Justine regrets that her friend has not paid sufficient attention to her explanation, for she had thought that she had explained it so clearly that any midwife

by reading could understand it. She consents, however, to summarize the presentations shown in the diagrams in which turning must be employed. (1) Where the child is represented with the head and shoulders presenting and lying on its back, unless the necessity be obviated by the rupture of the bag of waters. (2) When the right arm of the child presents, and the feet are at first under the breast of the woman. Here in Figs. 4 and 5 the use of the fillet is shown. (3) When the back of the child presents, and the arm is behind the back and comes down, as in Fig. 9. (4) When the position is as in Fig. 11, the back presenting and the hand not down yet, then the feet must be brought down with the fillet. (5) When the belly presents and the cord is prolapsed. (6) When both

Fig. 7.

hands present and the head of the child lies on its back, as is seen in Fig. 16. The whole process of turning is shown in five figures, 17, 18, 19, 20 and 21 (vide Figs. 7, 8, 9, 10, 11). No. 21 shows how far the position of the child is influenced by turning. Justine insists that the extraction of the child ought to be understood by every midwife, although nature after the turning will herself generally end the process. "In all these cases turning must be performed in order to preserve the life of the mother, and all these, when once the bag of waters has been ruptured, must be turned on the feet. The sooner the turning is done the better for the mother and child. Sometimes version can be avoided if a skilled midwife is called in in time, for she can sometimes bring the head into place if the membranes have not been ruptured."

FIG. 8.

FIG. 9.

FIG. 10.

FIG. 11.

Next she takes up the positions in which turning is not indicated, although a skilled midwife can do much. "(1) Birth is possible when the child's face is turned towards the back or abdomen of the mother, although the presentation is harder when the face is turned towards the abdomen, because the chin is liable to catch against the pubes. (2) When the hands and feet present together, the feet will come down quicker because they slip better. (3) When the knees present and the feet come down. (4) When the buttocks present. (5) When a hand and the head come together and the head is not caught by the pubes, if the child is very small. (6) When the hand comes down with the buttocks it is not always dangerous. (7) When the hand comes down and is immediately followed by the feet. These births deceive the midwives and make them think that children can be born no matter in what position they may be. But they do not understand that by violent pains nature alters the position so that the child can be born. Thus midwives are wont to say that 'the child can be born when its hour comes.' Some of these births, however, where the child is born after labor of two or three days, could have been much shortened and the life of the child might have been preserved by timely assistance. Midwives are too apt to use the knowledge which they possess of stimulating the pains, and do so often without any regard to the nature of the case."

Her armamentarium seems to have consisted of the fillet and blunt hook. She tells us that at first she employed a sharp hook, but experience taught her that one with a blunt end was more suitable. Conservative in her practice, she deprecates any unnecessary interference with nature, but does not hesitate to act at the proper time. Though she says it is sometimes right to rupture the membranes, she lays great stress upon the proper direction of the head by manipulation, and only when this is impossible will she resort to turning. She recommends the employment of the hook in the extraction of the dead fœtus if the mother is exhausted; and although she modestly leaves the decision to "wise men," we cannot but see that she deems it right to sacrifice the life of the child in case of great danger to the life of the mother. Where it is possible she considers version preferable to embryotomy. She condemns the use of the speculum except in the case of tumors, and prefers to use the hand. She adds: "As long as danger does not threaten the mother there should be no question of the employment of the hook. If all midwives understood their business and made no mistakes at the beginning of the birth or in their methods of traction, the use of an instrument would never be required. I seldom have had to employ the hook if I have been summoned at the beginning of the labor, unless some complication, such as hemorrhage or great exhaustion of the woman, necessitated its use. As a rule I have found gentle manipulation to be sufficient, where I have been called early. For such, manipulations and even turning are better both for the mother and the child than using the hook."

"Why, then," says Christina, "since you say that by manipulation you can always assist, have I seen you when called to a labor wait a day or more without doing anything, and finally employ the hook?" "In each case," says Justine, "I was called too late. When called too late I have been obliged to use the hook, but this I am unwilling to do until I have waited to see perchance whether nature would bring about the birth."

Christina: "Why then did you in one case send for a certain Frenchman? For you were accused of not having been able to do anything without using the hook, and yet he brought the labor about without the use of any instrument."

Justine: "Because I wished to prove to my enemies that I used no instrument unless compelled to do so. The woman was not young, a primipara in labor for two days and two nights, and the child was dead. I tried to bring down the head, but was unsuccessful, and I saw no means of saving the woman without using the hook. I sent for this man to see if he could do better, and he promised that the child should be born in one hour without the use of any instrument. This was at 11 a. m.: he worked unsuccessfully until the evening, and then privately asked me whether I had a hook or any instrument to make traction with. He attempted to use the hook, but again was unsuccessful; then he begged me to use it and make a hole with it in the child's head. On examination I found that in his efforts he had with his fingers made a hole in the head so that I was able easily to tear it in pieces and thus the child was delivered. Was I not right in saying that by the use of the hook, in some way, a hole must be made in the head of the child?"

But Christina is not yet silenced and asks: "But in other cases it is said that this Frenchman was successful where you could do nothing." "This," says Justine, "is mere calumny and a lie." Christina: "But you yourself confess that no hook was used and that the hole was made with the fingers." "This time this was merely luck, and the success was due greatly to the strength of the woman and because the efforts that Balbierer made were sufficiently violent to break in the skull, although he did not know that he had done so. Even then I perforated the meninges, the membrane over the brain, with a hairpin. All that the Frenchman can say is that he was stronger than I was."

We will again resort to a free translation of Justine's own words. "Obstinacy of the women as well as the ignorance of the midwives are often factors in tedious labors. In one case the woman would not allow the midwife to do anything until the membranes had been ruptured. The midwife was in error because after the bag of waters had ruptured she allowed three days and nights to pass before proceeding to assist the labor. Of course, if the labor comes on not too long a time after the rupture of the bag of waters, and if the presentation is favorable and the cervix dilated, it is not wrong to wait a while for the necessary pains. Midwives must never be afraid, however, to say what is necessary, for if the patient dies the blame will always fall upon the midwife. Suppose, however, the waters are ruptured and the presentation is found to be unfavorable, then turning is necessary. Turn, if possible, before the hard pains come on. After turning, you may leave the rest to nature, strengthening the mother and child, however, because they are exhausted by the turning. This is more especially the case in delicate women. If the membranes rupture and the cervix is dilating slowly so that it is impossible to turn, dilatation can be assisted by the insertion of two fingers into the cervix."

She defines labor pains as "the expression of the natural force which brings forth," and adds that if the child lies in a natural position, at the right moment he will be expelled. But if the presentation be transverse he cannot be born. She continues: "For if you are looking out of a window with your body in the long axis of the window, a person from behind can easily push you out, but if your body be across the window this cannot be done." She considers it the duty of the midwife to inform the patient where there is necessity for active interference, and where the woman is unwilling to submit, to use persuasion; otherwise if the midwife remains silent she cannot be held guiltless if untoward results occur.

After explaining the plates which show the various manipulations, she adds that the feeling of horror which they make upon the mind should impress upon us the necessity of taking timely precautions to prevent the necessity for such operations. For our comfort, however, she is prepared to bring up women as witnesses and to prove that the pain is not so terrible as one might think.

Christina asks: "Some weeks before labor you made a diagnosis of an unfavorable presentation. How can this be done?" To this Justine replies: "When the child is fully formed and lies still, the presentation will generally be favorable; but when they are moving and are small, they can take up various positions. As a rule, the natural position is taken up at least two months before labor. The unfavorable presentations then come about from the fact that the child moves right up to the time of labor. The appropriate opportunity must be seized when the child takes up a favorable position and the membranes must be ruptured. Unfavorable positions usually occur in the case of children who at no time in the second half of pregnancy have presented well."

She recognizes the danger of hemorrhage in cases of placenta prævia, and seems to have known how to treat them. She attended six hundred cases before meeting with a case of adherent placenta. In the first few cases she applied warm fomentations to the abdomen and pulled gently on the cord. In two cases she was quite unsuccessful, and, emboldened by experience, she afterwards did not hesitate to insert the hand into the uterus (using the cord for a guide) and to peel off the placenta. She adds: "Expression is useless because it is more liable to cause hemorrhage. I have seen death caused in this way. In any case the condition is dangerous."

Her remarks on the subject of twin births show careful observation. She attributes the success of ignorant midwives to the fact that so many labors are normal. "God, however, has ordained that some labors should be hard, and therefore has provided proper methods to meet them. These methods, then, I have tried to teach. One woman who had borne eight children normally used to say, 'What a fuss women make over childbed. I would be willing for a one-farthing or a two-farthing cake to bear a child,' but in her ninth labor she lay five days, and as the proper help was not forthcoming, she died with her child. Thus it is not written in vain, 'Be not deceived, God is not mocked,' and I think that those people who speak ill of me in their ignorance will have to answer for it. The mighty God will protect me against all calumniators who in their ignorance speak in an unchristian way of me and hold that my assistance is unnatural and therefore devilish. God, however, has given us intelligence which we have to use, and it is a pity that there are so few midwives who recognize this and who do not know, neither wish to know, anything beyond receiving and delivering a child when it falls into their hands. They argue that a midwife can do no more because these things are hidden from them. God can help without making use of natural means, but he has given us means and ways to meet difficulties in labors which we are bound to use, therefore it is written, 'Pray and work, and then God will bless you.'"

After deciding that it is better to cut the cord too long than too short, she says that when cut it should be tied for fear of hemorrhage which might prove fatal to the child. "Where the cord is thick it may be necessary to tie it twice. I have seen cases of secondary hemorrhage from the cord which were fatal. Too sharp and thin a string should not be used because it may cut through the cord. This happens where the cord is fat. I hold it better to cut the cord as soon as possible after the child is born. In this way the woman can be attended to better when the child is out of the way, and it is better for the child, especially when it is weak. The reason given by some for leaving the child till the placenta comes away is that the movement of the child assists in the delivery of the afterbirth. I never delay in the case of a weak child. In many cases the cord is so long that it would be necessary for the child to jump and dance on the breast of the mother before the cord would pull upon the placenta. The danger consists in the fact that when the placenta receives air it presses down and may cause closure of the cervix. This closure must be prevented, so I say that if the child is weak, let it be separated from the cord at once. But if it be strong and no difficulty is experienced in the delivery of the placenta, let it wait. But if there is delay, let it be separated at once."

Where her patient is nervous and her time for action has not arrived, she contents herself with comforting her, and like some Homeric hero addresses her "with winged words," but she assures us that she never allows words to take the place of deeds.

She seems to have understood the management of a case of prolapse of the cord, and if her practice was always according to her precepts we cannot but feel indignant at those calumniators who accused her of too great rashness in rupturing the membranes. She expressly states that no one who does not understand version should ever dare to rupture the membranes. Our righteous indignation against these calumniators has led us to abstract somewhat fully the following protocol testified to in Liegnitz on the 13th of March, 1682, which reads somewhat as follows:

The honorable and virtuous lady Justine, formerly Dittrichin, the renowned and experienced midwife of this place, has been accused of things not lawful: (1) of hastening the births of children, (2) of employing (as she has done successfully) the rupture of the membranes. Therefore the court has summoned to witness here certain women who were profited by her efforts, that they may testify without fear or favor how Justine has acted with them in such a crisis.

Frau Maria Dittrich had some eight and children, and hearing that a wise woman had come, sent for her. Several

weeks before the term the presentation was favorable, but just at the time of labor feeling that this had been changed, she sent for Justine. Justine found the hand projecting from the womb. She replaced it and brought the head down. But finding that the pains were disturbing the position again, she corrected it three times. The third time the bag of waters ruptured, whether naturally or whether from the operation is not known. Still the woman remained all night in labor. Frau Justine recommended that the feet should be sought for and brought down, but was unwilling to do this without consulting with a physician. Dr. Kerger was called early in the morning, as soon as the gates of the city were opened. He did not agree with her suggestion, but said that tonics should be given and then the birth would come about by itself, whether the woman died or not. After the first powder the woman became perfectly black and blue on the labor stool, and they thought that she was going to suffocate. Under these circumstances she begged Frau Justine to save her in any way she could, the patient holding herself responsible. Putting the woman with the head low that the head of the child might go upwards, Justine inserted her hand in search of the feet of the child, but because by this time the child was doubled up it could only be born dead. The next time she was pregnant Justine visited her several times, and before the time of labor found the presentation good. Four weeks before labor the woman was seized with a fever, so that it was feared that the child would remain small. The child presented with the feet, but being small was born alive and baptized, only dying after thirty-six weeks. She was called to a third labor of the same woman, and remembering that the two previous children had taken unfavorable positions, she thought that this could only be prevented by an opportune rupture of the membranes. This was accordingly done and a healthy daughter was born, who is now over eight years old. A few days before her next labor, Justine having on examination found everything to be favorable, recommended that the waters should be ruptured at once. Unfortunately the woman was not willing and Justine was not able to remain with her. Three days afterwards a dead child was born.

Among others, Justine obtained a testimonial from the city council of Ohlau which bears witness that "among other women she has succored our honorable and virtuous Barbara Stieflin, our now widowed paper-maker."

"Domestic remedies," says Justine, "are medicines, and therefore they come in the domain of the physician and not in that of the midwife. The great diversity of opinion that exists as to the efficiency of different remedies proves that they are not reliable. Again, supposing a remedy to be given by an unskilful person, he may give too much or too little, or give it at an unfavorable moment." To make matters clearer, she gives in full the protocol of the medical faculty of the University of Frankfurt with regard to domestic remedies to be used in the calling of midwives, together with the following instructions: "(1) In weakness of the newborn child, a midwife is justified in giving *corallen saft* (coral juice). (2) In the case of sudden hemorrhage of a woman in labor or in the act of aborting, *teschel kraut* can be bound upon the pulse, or instead of it *carpentels wasser* may be given. (3) The

peeling off of the placenta before the right time of birth cannot be done without injury. (4) A child so prematurely delivered who does not die within three years of its birth cannot without further proof be considered to have died from the premature birth." Probably because she herself had been the object of somewhat malignant accusations, Justine refers at length to the case of a certain Titia, a midwife who had been accused of various malpractices. She quotes also the protocol of the medical faculty of Leipzig and Jena, which sets forth Titia's innocence, and which declares that the rupture of the membranes is sometimes indicated. This last declaration must have been especially pleasing to Justine.

Chapter IX treats of the proper time of putting the woman to bed, of severe labors, and of the preparation of a convenient labor stool or bed. Christina thinks that changing the position of the woman might sometimes be made to serve instead of turning the fœtus *in utero*. "Some bind the woman on a plank and put her with her head downwards. Some roll her over on her side. Some lay her on the table and roll her from the table on to straw, so that she falls suddenly." Justine denounces all these methods as dangerous and calculated to do harm to the woman. "Put a piece of meat in a sack, fasten it tightly, throw the sack about, roll it over, open it and you will find the meat in the same position. Even so with the womb and the child. The idea smacks of superstition, just as another which holds that a parturient woman cannot get well as long as there are any knots about her. This of course is a superstition arising from a true idea that none of the fastenings of the clothes should be too tight."

Then follows a detailed explanation of the labor stool, represented in Figures 184 and 186.

The second part of the book is an inquiry to find out if Christina has fully understood and grasped the teachings of Justine. It is in the main a repetition of the teachings of the first book, but contains a number of additional minor details which are not without interest, although we have at times a painful sense that Justine has anticipated by a century or more the day of "Quiz compends."

In answer to Christina's question: "Can we reckon accurately the date and hour when a labor should take place?" Justine replies, "No, God can confuse the wise so that no man can boast of his wisdom. (2) Some women have their catamenia once after they are pregnant. (3) Some do not have their catamenia and yet are not pregnant. (4) Some have no idea when they became pregnant. (5) Some have their catamenia up to the time of labor. And (6) even after the first quickening has been felt, no date for the labor can be assigned, because one woman feels this before another. There are, however, some signs of an approaching labor. There is some difference in the later months in the condition of the os. In those who are wont to have easy labors the os becomes soft shortly after the fifth month, and eight weeks before birth it begins to open a little. In those who have tedious labors it remains hard until the time of labor. There are women who believe themselves pregnant and are not so, and yet the abdomen is swollen. By internal examination in the last three months of gestation it is easier to make out the existence of the fœtus than by external examination."

Justine says that the distinction between false and true labor pains is easy. "False labor pains run transversely across the abdomen, and instead of opening the os cause it to close. True labor pains gradually dilate it." She speaks at some length of the care and treatment of women during pregnancy, and after telling Christina how the midwife should proceed in a case of labor, she concludes the book with the following words: "Since I am well pleased with thine answers to my questions, in conclusion I would wish that thou by the diligent use of those means at which my well-meaning instructions aim, may become more and more learned, and may enjoy in thy profession the help of Almighty God and His rich blessing. To God alone be the glory."

In an appendix giving instructions as to the medicines which should be employed and the treatment to be followed in cases in which the help of a physician cannot be obtained, and in the directions as to the care of the infant, she shows a great deal of sound common sense. Into her polemic with a certain A. Petermann (who was also noted for a monograph on gonorrhœa) on account of a work which he had written, and in which he had said that her book, although much praised, contained "vain speculations which were absurd for practice," we cannot enter now. Let it suffice to say that we range ourselves on the side of Justine against the aforesaid Petermann, and although we have felt that the work was a little tedious at times, some blame must surely be laid upon our eyes, which after a while tire of the old German type. And if we have seemed to read the same ideas over several times, it is only charitable to suppose that the ordinary midwife could only be taught by such repetitions. Despite her pious phraseology Justine does not seem to us to be either hypocritical or superstitious. With all her quiet faith that all things are ultimately in the hands of God, she insists that He acts according to certain laws which we are in duty bound to strive to discover. Finally, if I were asked to prepare a new edition of Justine Siegemundin's book, in order to render it useful as a text-book of the present day, I should endeavor to confine myself to such alterations and additions as modern discoveries would necessitate, and should try not in any way to obscure the personality of the author, being convinced that careful observation, conservatism in practice and sound common sense are as necessary now as they were in the eighteenth century.

A CASE PRESENTING THE GROUP OF SYMPTOMS TERMED ASTASIA-ABASIA.

By FRANK R. SMITH, M. D., *Assistant Resident Physician.*

[*Shown before the Hospital Medical Society.*]

Z. B., the female patient who has just walked out of the room, married, aged 31, was admitted on November 10, 1893, to Dr. Osler's wards, complaining of inability to walk or to stand.

Family history.—Father and mother living; one sister, one brother living. Brother, aged 18, has had several attacks of asthma (?), during which he has jerkings in the legs. No fainting fits; no further history of nervous diseases in family. Tuberculosis in some members of father's family.

Past history.—Never robust, usual children's diseases. Typhoid fever at 12, catamenia at 13. Menses always inclined to be irregular; some dysmenorrhea. Four children born living. No instrumental interference. Thinks she has had slight attacks of renal colic and has passed small stones at various times, but has had no sign of this for more than four years. Has gained 30 pounds in the last three years. Was always a great pet at home and has a very kind husband.

Present sickness dates from four years ago. About thirteen years ago went to bed one evening feeling well. In the night was seized with an attack of jerking. Legs and arms jerked, and the knees and hands came together in spite of all efforts of the patient to prevent it. The attack lasted twenty minutes, and ceased when patient was turned upon the right side and had been given a dose of peppermint water. Patient can think of no cause for the attack. Next morning was weak, but was able to be up and about next day. Had other similar attacks, often produced by any little worry. Never lost consciousness during the attacks. Never able to nurse her children without suffering from weakness. Last child was born four years ago. Lying-in was good, and patient had gotten up feeling well. A

few nights afterwards, while in bed, had an attack of jerking, and the next morning, on trying to get out of bed, would have fallen had she not caught hold of a chair. No especial pain; was unable to walk for two days, after which time she was as well as before. These attacks have recurred several times, but she did not worry about them much until two years ago, when she was unable to walk for nine days. Was treated with electricity away from home for six weeks and felt well, but two days after returning home she again became helpless. In the last year has had some six attacks. Sometimes she is unable to stand or walk for some days, then is perfectly well for two days, and suddenly relapses into her former condition. Has a feeling of oppression about chest and sometimes about head. When she has the attacks she is unable to move a limb except in bed. In the recumbent posture has good use of her limbs. No globus hystericus, no sensory disturbances, no diplopia, occasional constipation, no pulmonary, cardiac or renal symptoms complained of. Thinks she may have some uterine disease, but gives no definite symptoms.

A physician who has known the patient all her life says that relapses vary in being due to exposure and sometimes by several causes after recovering. Some weeks after recovery complained of pain down the legs, and the next morning has been unable to walk. The husband denies this. An examination of the uterus was apparently by Dr. Kelly was practically negative.

The lungs, heart and other organs were on examination found to be normal. The urine showed nothing pathological. Patient walked into the ward with a little assistance.

·Note of November 11th : When standing, complains of weakness in the knees ; the head seems to fall forward, a look of distress comes over the face, and she trembles, more especially in the legs, and cannot stand without holding on to something. This morning patient got out of bed unaided. Moved legs from hips when getting up. Stood up by herself and then made one or two attempts to walk, and would have fallen if she had not been caught. It seemed impossible for her to put one foot before the other or to make a step. Complained of no pain. Attempted movement not painful. Effort seemed to exhaust her a good deal, and she perspired freely and said her head throbbed. On November 15 patient got up of her own accord and walked to the main entrance, a distance of over 100 yards, perfectly well, without assistance, to mail a letter. A day or two afterwards she had a relapse and could not walk at all.

It was always a matter of doubt with the visiting physician whether he would find his patient looking well and walking about or absolutely incapable of walking. During her stay at the hospital she had several relapses, and five days before leaving could not walk, whereas when she left she walked almost perfectly, though possibly a little slowly. The attacks often came on suddenly. For instance, on more than one occasion, after walking down the corridor from her room, she was unable to get back without assistance.

The fields of vision were taken twice. On the first occasion there seemed to be slight scotomata, but on the next examination (which seemed more reliable) these were not demonstrable, and there was no narrowing of the field in either eye. An ophthalmoscopic examination was made by Dr. Randolph, who found both fundi perfectly normal. He found, however, a high degree of myopic astigmatism and some slight weakening of the internal recti muscles. Patient does fancy work, using materials of various shades and seems to distinguish colors perfectly.

The following note was made by Dr. Thomas, who saw the patient with me on November 29, 1893, on which occasion she could walk quite well :

Eyes restless ; freely movable in all directions, but can be held quite still. No nystagmus. Pupils equal, moderately contracted ; dilate and contract when fixing an object; react freely to light and on accommodation ; not influenced by pinching side of neck.

Muscles of face act well and equally. Masseters and temporals act well on both sides. Mouth can be opened wide; not deflected. Lower jaw protruded and moved laterally in a normal manner. Tongue protruded straight; is steady. Patient feels slightest touch of finger on the face. Distinguishes well between the head and point of pin.

Sensation for warmth and cold normal. Tastes sweet and bitter. Hearing good.

When the hands are held out there is a fine tremor affecting the hands and arms, more marked on the right than on the left side. Movements about all joints of arms are free. No signs of ataxia. Muscular strength is good, though patient is indisposed to make any protracted effort. Hands (during examination) are clammy and covered with visible sweat.

Sensation to touch, pain and temperature on chest, forearms and hands perfectly normal.

Deep reflexes (triceps and periosteal) active on both sides, often followed by a voluntary jerk. Raises herself into a sitting posture (while lying in bed) with some difficulty, but when sitting up resists well all attempts to push her down. When on back raises right leg (extended) from bed until the heel is about a foot from the bed. Says she is unable to raise it any higher, and when she makes a greater effort the leg is thrown into jerking clonic contractions. When knee is flexed patient can flex thigh on abdomen to more than 45°, and can then be induced to extend knee. With knee flexed and thigh flexed on abdomen, resists strong effort to extend thigh. Examination of left leg gives same results as that of right. Flexors and extensors of leg strong on both sides. Flexors and extensors of foot normal. Abduction, adduction and rotation (in and out) good. Muscular sense everywhere intact. Sensation to touch, pain and temperature normal.

Deep reflexes (finger on patella, finger struck) are active. On percussing finger with patella depressed, a quick jerk of tendon of quadriceps is obtained, often followed by a voluntary jerk. Tendo Achillis reflex present. No ankle clonus. On reinforcement there is a suspicion of a patellar clonus on the right side. The plantar reflex is less active on the left side than on the right. Patient writes well. Electrical examination (right arm and left leg) absolutely normal.

In the latest edition of his work on nervous disease Gowers says of astasia-abasia : "It occurs chiefly in those past middle life, in the gouty, and in those who have degenerated vessels. The patient when walking suddenly loses the power of standing or walking, or when sitting he will suddenly bend forward, his head dropping forward upon the chest and his body losing its power of support." His cases got well generally under nervines and cardiac tonics and proper attention to the constitutional condition. Gowers says particularly that these symptoms must not be confounded with the "giving way of the legs" met with in hysteria.

Up to November, 1891, only 49 cases had been reported, and these are all mentioned in an article by Knapp in the *Journal of Mental and Nervous Diseases*. In adding one more case to the list, he takes the opportunity of reviewing the literature on the subject, and gives an abstract of all the cases which had been reported up to that time. In 1892 Prince reported " a case of so-called *astasia-abasia*," occurring in a patient who he thought was suffering from paralysis agitans. Britto reports an epidemic of cases in which these symptoms occurred accompanied by choreiform movements, and identifies it with the *abasie choréiforme* of Charcot and Blocque..

Olivier reports a case in a nervous and emotional boy of seven. There was no history of nervous disease in the family, but the mother was delicate and the father an old arthritic and alcoholic subject. The patient had never had fits. There was no history of trauma, nor of fright, except on one occasion, several months before. The boy was well within 60 hours and had no relapse.

Kovalevski gives three references which have not, to my knowledge, been translated from the Russian, and which I therefore could not consult.

Weill reports a case of astasia-abasia of the choreic type which was arrested instantly by pressure on certain regions. He adds another in which the patient was undoubtedly hysterical, and could not walk unless she wore a bandage by which pressure was applied to both shoulders. Tournier reports two cases of which I could find only an incomplete report. In one, for several years the attacks of astasia-abasia, which were associated with chorea, could be cured by the Paquelin cautery, but later these means proved ineffectual. Pittaluga had under his care a boy of 9 years old, who at one time used to make a noise when swallowing as if he had an obstruction in his throat; this ceased spontaneously. After having typhoid fever and being in bed for 25 days, his legs "became like wax" and he could neither stand nor walk, strength and sensibility remaining normal. Benedikt regards astasia-abasia as a symptom of hysteria. In De Renzi's case there had been a diagnosis made of progressive bulbar paralysis. The patient had had fits with loss of consciousness. She was unable to speak, there were psychical changes and also changes in sensation. Borgiotti gives a case of astasia-abasia in a hysterical patient in which there was a profound lesion of sensibility which he considered of hysterical and not of organic origin. Thijssen reports four cases and has an excellent article on the subject which is very comprehensive. His first patient, a girl of 11 years of age, who was an epileptic, had also astasia-abasia. After an attack of epilepsy the fields of vision were narrowed, but the power of walking was improved. The patient had several relapses and was lost sight of. The second patient, a girl of 12½ years, though unable to walk, could sit in a chair when the back was supported, but if taken off the chair would become unconscious, except that she could swim if laid on the belly. When in the rolling chair she could use her feet to propel the chair. Cured by douches. His third patient had choreic movements and had something which resembled hysterical hemiplegia. The fourth patient, who had had dysentery when in Tonquin, could not walk, and any attempt produced a saltatory spasm. He finally got better.

Thijssen gives again the ideas of Charcot and Blocque as to the ætiology and nature of the disorder. "The affection is generally evoked by some slight trauma or some violent emotion. In some cases it comes on after intoxication from various causes. In one case it occurred twenty-two days after the patient had been poisoned by carbon monoxide. In other cases it appears to be due to over-exertion. The onset is often sudden, but not infrequently it comes on slowly like the symptoms of traumatic hysteria. It is seen more often in young people than in those of middle age or the old, and some hereditary predisposition seems necessary, and this in fact can often be found when the exciting cause cannot be decided upon." Strictly speaking the characteristic of a pure case of astasia-abasia lies in the fact that "while the patient is lying down the muscular power is not affected, but for the special movements for standing and walking it is lost." As to the diagnosis, Thijssen holds that it can only be confused with tabes and Friedreich's disease. But in these cases the inco-ordination exists for all movements of the lower extremities. The hysterical ataxia of Briquet and Lasègue is only

present when the eyes are closed. The flaccid hysterical paralyses are to be recognized by the fact that when the patient is lying down all power of moving the legs is absent. In rhythmical chorea, rhythmical and regular muscular twitchings are to be observed. The reflex saltatory spasm of Bamberger shows itself by spastic paralysis, increased reflexes and epileptic twitchings.

Binswanger excludes all cases in which muscular contractions, trembling, and clonic spasm of muscle are present or where walking is interfered with by actual bodily pain. The French writers are inclined to consider astasia-abasia in every case as a symptom of hysteria, but, as Knapp remarks, although in quite a large proportion of the recorded cases hysteria was present, it would be illogical on that account to presuppose the existence of this affection in every instance. In his own case and in that of Prince the symptoms were accompanied by those of an underlying disorder, viz. paralysis agitans, but in others they have occurred without any other definite indications of disease.

To sum up, then, we have here a comparatively young patient of decided neuropathic tendencies and in whom, after careful examination, we can find no signs of organic disease. Beyond the peculiar attacks which her brother has had, there is no family history of any nervous disturbance. Life has been made smooth for the patient, and she has never been called upon to undergo any undue exertion of mind or body. Added to this, we have a history of attacks of "jerking" easily produced by any emotion and cured by the most simple procedures. The stigmata of major hysteria are absent. We have the alternate dilatation and contraction of the pupil when fixing an object, the slight tremor in the hands, and the inability to raise the heel from the bed more than a foot when lying down. With these factors, what diagnosis shall we make? The recurrent attacks of inability to stand or walk, which are present one day and absent shortly afterwards, certainly allow us to say that the patient shows the group of symptoms termed astasia-abasia, but have we sufficient grounds for saying that this group of symptoms is associated with hysteria? To look at her indeed as she attempts to move she presents the picture illustrating the condition of mind which has been described not as "I cannot," nor as "I will not," but "I cannot will," or perhaps we might prefer the description of Guislain, quoted by Ribot, in which he refers to *aboulia*: "The patients can will to themselves mentally according to the dictates of reason. They may feel a desire to act, but they are powerless to make a move toward that end. Their will cannot overpass certain bounds: one might say that this force of action undergoes an arrest. The *I will* is not transformed into impulsive will, into active determination."

In treating of functional neuroses or those conditions in which no anatomical lesion can be recognized, it is often impossible to find a satisfactory differentiation. It is to be hoped that there may ultimately be some law recognize, at least one or perhaps some definite changes, either chemical or histological, to account for the production of symptoms which have long been recognized, but the ana- tomical causes of which are as yet been demonstrated.

In Dr. Osler's article on astasia-abasia I am unwilling to make

any definite statement as to the diagnosis in this case. I believe, however, that he is inclined to regard the case as one of hysteria.

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PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS HOSPITAL MEDICAL SOCIETY.

Meeting of November 18, 1893.

The Direct Examination of the Female Bladder and Catheterization of the Ureters.—Dr. Kelly.

There has been no class of diseases so difficult to diagnose accurately and treat satisfactorily as those of the bladder, on account of the imperfect methods of examining the interior of this organ.

I wish to allude briefly to the history of this subject. In Heister's German translation of Peter Dionis' work (1734) there is a minute description, accompanied with cuts, of the necessary instruments for dilating the urethra preparatory to the extraction of vesical calculi by means of bimanual manipulation, through the vagina and abdominal wall. This was called the minor operation. In the major operation of Dionis the external meatus was incised laterally, the urethra dilated, and the stone delivered with forceps. The most careful work of recent years was done by Prof. Simon in 1875. He improved the methods of the past, which had been so long in vogue, and defined the limit of danger in the dilatation, which he considered to be 2 cm. in diameter, or plus 6 cm. in circumference. Simon's method consisted of three steps : 1. Incision in the external orifice of the urethra ; 2. Dilatation of the urethra with specula plugged with obturators ; 3. Bimanual digital palpation of the bladder. By this method he was able to explore the bladder and locate the ureters. In this way he succeeded in catheterizing the ureters 17 times on 11 different women.

Following Simon, Grünfeld wrote extensively on this subject in 1877, and instead of exploring the bladder by digital palpation he employed a metal cystoscope, consisting of a hollow cylinder, blackened on its interior and having a plain glass fitted obliquely over its vesical extremity. A small parallel tube running down the side carried the ureteral catheter. By distending the bladder with water, he was able to locate and catheterize the ureter with this instrument. This method, however, was unsatisfactory and was never generally adopted, and there has been practically no advance in this line of work during the past fifteen years. The complicated cystoscope of Nitze and Leiter has been of great service in the hands of a few specialists, and by its aid the ureters have been catheterized in the male. As the instrument, however, requires considerable skill in manipulation and is expensive, it is of little use to the general practitioner. For this reason I especially claim that the method which I have devised is a decided advance in cystoscopy, as the instruments required are very simple,

inexpensive and easliy manipulated. Skene in the last edition of his book claims that the only satisfactory cystoscope is that of Nitze and Leiter, and thus defines the status of cystoscopy at the present time.

I shall now describe my method of exploring the bladder and catheterizing the ureters. The only instruments necessary are the Nos. 8 to 14 dilators and Nos. 10 to 13 specula with their obturators, simple suction apparatus, ureteral catheter, ureteral searcher, long delicate forceps for carrying pledgets of cotton into the bladder, and small pledgets of cotton.

To properly illuminate the interior of the bladder a head mirror and good light are required. The success of this examination largely depends upon the posture of the patient. She is placed in the dorsal decubitus, with hips elevated upon cushions from 18 to 30 cm. above the table, which causes the bladder to distend with air. The patient in position, I proceed with the examination in the following manner : I first dilate the urethra with the graduated dilators up to 11 or 12 cm. in circumference, for simple examination. The speculum corresponding in size to the last dilator is next inserted and the obturator withdrawn. The urine is removed with the suction apparatus and the pledgets of cotton. Now by inclining the speculum to one side or the other about 30 degrees from the median line of the body, the ureteral orifices are usually easily found. In this case the orifices are very distinct and I am able to pass the catheter at once. Not only am I able to catheterize with ease the ureters, but the entire bladder wall can be inspected. In this way one can readily discover isolated areas of ulceration, tuberculosis, cystitis, and in fact all of the macroscopic lesions of the bladder.

Exhibition of Specimens from a Case of Carcinoma of the Pancreas with Multiple Carcinosis.—Dr. Flexner.

Dr. Hewetson.—A brief synopsis of the clinical history of the case, that Dr. Flexner intends to demonstrate to-night, may be of interest. The patient, a male, æt. 34, was admitted to Dr. Osler's ward on the 24th of October, complaining of swelling in the abdomen and some general pain, especially in the upper zone. The family history was good. He had never been ill before excepting from an attack of malarial fever 15 years ago. Present illness had lasted about a year, there being no marked symptoms, but gradually increasing weakness. He had no symptoms of stomach trouble up to the time of admission, but had been jaundiced for about a month. He had lost 30 pounds during the past 5 or 6 months. Examination showed the patient intensely jaundiced, abdomen generally

distended ; movable dulness in the flanks; palpation not very satisfactory on account of the distension. We were, however, able to make out a large firm mass in the upper umbilical and lower epigastric regions. The urine was high-colored, bile-stained and contained a trace of albumin ; no sugar was detected. The stools were clay-colored, semi-solid, and microscopically showed much fat. Dr. Osler made a diagnosis of probable carcinoma of the pancreas with secondary involvement of the gall-bladder and stomach, as altered blood was found in the test meals withdrawn, while HCl was always absent. The patient had come in with the idea of having an operation done, as the diagnosis of some trouble in the gall-bladder had been made. As this was wished and we were not very certain of our position, owing to the distension of the abdomen and the amount of fluid in the abdominal cavity, Dr. Halsted made an exploratory laparotomy and found a large carcinoma involving the head of the pancreas with secondary implication of the stomach, the bile-duct and neighboring glands. The patient did well after the operation, the wound healing by first intention, and was relieved by the evacuation of the fluid. He grew, however, gradually weaker and died two weeks after the operation.

DR. FLEXNER.—I shall exhibit to you this evening only a part of the specimens which were removed at the autopsy made yesterday morning a few hours after the death of the patient. The individual was slightly built and greatly emaciated. Œdema of the extremities was present. The surface was distinctly jaundiced, the conjunctivæ were yellow.

Two centimeters to the right of the median line there was a linear incision, beginning at the costal margin and extending downwards 14 cm. The wound was united ; the black silk sutures were visible in both ends of the incision. The subcutaneous fat was much wasted ; the subcutaneous tissues were jaundiced and slightly œdematous. The peritoneal cavity contained 4800 cc. of slightly turbid, bile-stained fluid. Both layers of the peritoneum were smooth. Beneath the peritoneum a number of punctiform ecchymoses were present.

The transverse colon was distended, and at the hepatic flexure it made a downward bend, bending again on itself and crossing the abdomen below the costal margin. In the median line of the abdomen a large tumor mass was situated, which was partly covered above by the dilated transverse colon. This mass occupied the upper umbilical and epigastric regions. The tumor was distinctly lobulated, intimately associated with the root of the mesentery, and a number of small nodules varying in size from a millet-seed to a split pea were observed on the under surface of the mesocolon. Additional nodules, many larger in size than those mentioned, occupied the pelvic peritoneum and were present on the superior and posterior walls of the bladder.

In the pancreas, corresponding in position with the head and a portion of the body, a large tumor mass was found. The part corresponding to the head measured 6 cm. in diameter. In consistence this mass was hard, and on section it presented a grayish-white, somewhat variegated appearance, and many yellow degenerated areas were to be seen in it. The tail of the pancreas was bile-stained, indurated and infiltrated in part with the tumor. The tail was in one part firmly grown together with the posterior wall of the stomach near its lesser curvature, and at this point the tumor invaded the stomach and appeared on the interior, forming a projecting, firm mass measuring 8 cm. in width and presenting a central depression. It projected 1.5 cm. above the surface of the mucosa.

As already mentioned, the root of the mesentery was firmly adherent to the pancreas, and the mesocolon was converted into a mass of large infiltrated nodules. The duodenum was likewise adherent to the mesocolon in front and to the tissues about the vertebral column behind. The pylorus was thickened and infiltrated throughout all its coats, and this infiltration extended to a distance of 15 cm. beyond the pylorus. The mucous membrane of the duodenum was in part ulcerated and beset with ecchymoses. At the bile

papilla an elevated nodule the size of a small walnut occurred which embraced the orifice of the common duct.

The gall bladder was distended with dark, thick bile. The bile ducts were much enlarged and contained yellow fluid bile. In the gall bladder at the exit of the cystic duct, a tumor mass involved the entire thickness of the gall bladder for a distance of 3 cm. square. The liver was free from metastases. The periportal lymph glands, on the other hand, were converted into tumor masses. The retroperitoneal glands were infiltrated, and the psoas muscle on the right side corresponding with the lower dorsal and upper lumbar regions, contained several discrete tumor noduies. Around the right kidney there was a tumor growth almost encompassing this organ. The left was similarly but less surrounded. Both kidneys appeared to be free from tumor, but the right adrenal gland was converted into a tumor mass. The remaining organs exhibited no remarkable pathological changes.

On microscopical examination, the tumor of the pancreas proves to be a typical carcinoma, composed of large alveoli with relatively small amount of stroma. The cells filling the latter are polyhedrical in size and possess distinct vesicular nuclei.

Sections made so as to include portions of the right kidney and adrenal gland show the former to be free from implication and the latter to be converted almost into a carcinomatous mass. Sections from the growth into the psoas muscle were made so as to include the adjacent bodies of the vertebræ to which the muscle was attached. The tumor was seen to pass into the muscle, and below it as far as the periosteum, but did not extend beyond this structure. The alveoli in the muscle at times were smaller than in the primary tumor.

Meeting of December 18, 1893.

Introduction of Bougies into the Ureters preceding Hysterectomy and the Removal of densely-adherent Structures adjacent to the Ureter. D... KELLY.

Since describing my method of catheterization of the ureters and direct inspection of the bladder for purposes of diagnosis and treatment, I have discovered a no less important use for this method. In a recent case of extensive carcinoma of the uterus upon which I proposed to perform vaginal hysterectomy, I felt that it would be necessary in order to facilitate the operation to know constantly the location of the ureters. To accomplish this I inserted two small hard-rubber bougies high up into the ureters before commencing the operation, and allowed them to remain in place until its completion. In this way I was able to avoid the ureters and to work much more rapidly, as the catheters stood out as hard cords and served as landmarks for the ureters. This procedure was so thoroughly satisfactory in that case that I shall employ it from this time on in hysterectomy and in all densely adherent cases in which there is danger of cutting or tying the ureters. The hardrubber bougies not only serve to mark the location of the ureters, but also keep them pushed down against the pelvic floor.

Exhibition of Specimens from a Case of Acute Pericarditis, Pleuritis and Peritonitis, associated with Contracted Kidney, etc. D.. FLEXNER.

D.. HOWELL... Dr. Flexner ... ... concerning the clinical side of the case, from which the organs he is about to show were obtained.

The patient, a man 47 years old, was first admitted to Prof. Osler's wards in April last, complaining of weakness and shortness of breath. His ... ... the usual diseases of childhood, including scarlet fever, what he calls white swelling of the knee from his twelfth until his twentythird year, and an attack of lead colic in his thirty-third year. He gave a definite history of syphilis, the primary lesion having been contracted in 1878. Seven or eight of his children died as infants. The symptoms ... ...

troublesome for some months, the shortness of breath coming on especially after exertion.

On admission, examination showed him to be a rather slender, delicate-looking man ; the left knee was swollen and ankylosed in a partially flexed position. The pulse was small and wiry, of medium volume, but of decidedly high tension. The heart was hypertrophied, the apex being in the sixth space 3 or 4 cm. outside the nipple line, and the second sound at the aortic cartilage was of a most accentuated, almost liquid character. The urine was as a rule pale, having a specific gravity ranging from 1005-1011, and contained a faint trace of albumin with a few hyaline and finely granular tube-casts. From the slightly thickened condition of the arteries, in a case where there was a distinct history of both lead and syphilis, a diagnosis of primary arterio-sclerosis with secondary changes in the kidney was made. Although the history was suggestive of possible amyloid changes, there was no evidence of this trouble elsewhere, and the condition of the urine pointed more to a chronic diffuse nephritis.

The patient's condition improved greatly ; rest in bed, a restricted diet, saline purges, diuretics and the use of nitroglycerine being the line of treatment which was followed. He went out in the end of May, to return after a few weeks again complaining of shortness of breath, and was again discharged much improved. The third admission was in August, when, in addition to the dyspnœa, there was slight general anasarca. The improvement this time was not satisfactory, the heart compensation was never completely restored, and instead of the high tension pulse and accentuated aortic second sound, there was a rapid low tension pulse, signs of a dilated heart, with gallop rhythm at the apex, and a second sound at the base from which all the ring had disappeared. Digitalis was given with good results at first, but these were not lasting. On the evening of October 12th, the patient, who had been short of breath for a day or two, suddenly became much worse, was found sitting up in bed gasping, lips and face cyanosed, veins everywhere much dilated and beaded, and the heart's dulness was found to extend beyond the right sternal margin.

Venesection was performed, and 500 cc. of blood were withdrawn from the median cephalic vein with great and immediate relief. The color and dyspnœa improved while the bleeding was being done, the pulse tension increased and the rate fell. In about a week a second attack occurred and bleeding was again followed by relief—only temporary, however, as the patient's condition grew gradually worse, and the œdema increased, being at one time very marked, and associated with ascites and hydrothorax. There had been, however, previous to this latter symptom, a well-marked coarse to-and-fro friction rub over the entire left chest, even over the precordial area.

The patient became comatose and lay in this condition some weeks, a complete left-sided hemiplegia developed, and Cheyne-Stokes respiration was a marked feature. Although this semi-comatose condition persisted for several weeks, during which time the patient received only nourishment, stimulants and enough morphia to keep him comfortable, his condition gradually improved before death, the œdema entirely disappeared, and the patient was able to answer questions. The hemiplegia remained unaltered, the wrinkling of the forehead being the only possible movement on the left side ; the mouth was drawn to the right and the tongue was also protruded towards this side. There was no strabismus, no apparent inequality of the pupils.

The case is a typical example of the course run by many of these cases of arterio-sclerosis with arterio-sclerotic changes in the kidneys. At first there was the extremely high arterial tension, compensated for by heart hypertrophy. Next, a failure of the latter, cardiac embarrassment, feeble pulse and increasing dyspnœa and general distress. In the hemiplegia we have an example of what so frequently follows changes in the cerebral arteries, while the long-persisting coma followed by slight temporary improvement is a warning against a too positive prognosis.

Dr. Flexner.—The specimens which I present to you to-night come from a sparely built, moderately emaciated man.

The dura mater was penetrated by large Pacchionian granulations which had eroded the skull-cap along the sagittal suture to which the dura was strongly adherent. Over the anterior two-thirds of the brain the pia was œdematous, and the meninges of the left hemisphere were easily removable, the convolutions being normal. The lateral ventricle was dilated and its ependyma was smooth. The right hemisphere was softened, anæmic, and the membranes could not be stripped off without injuring the underlying brain substance. The softening was less marked or absent over the tip of the frontal lobe and over the middle and inferior occipital convolutions. The cortex formed a distinct line, appearing less altered than the white substance. It was, however, beset with small hemorrhagic eroded points. The lateral ventricle was dilated, and the basal ganglia were involved in the general softening.

The right internal carotid artery was occluded by a thrombus mass which was in part decolorized, and more adherent to certain atheromatous plaques in the vessel wall. The vessel just before it enters the cranial cavity was markedly dilated, measuring 14 mm. in width.

The pericardial cavity contained 60 ccm. of serum, and both layers of the sac were covered by a fibrinous deposit. The heart was hypertrophied, the left ventricle being especially hypertrophied and dilated, the wall of the latter measuring 20 mm. in thickness and the cavity 10 cm. in length. The aorta above the valves to the end of the arch showed little sclerosis, but in the thoracic portion sclerotic patches were more common, and at the origin of the caeliac axis and superior mesenteric artery they were more marked still, and the thickening was followed into the arteries given off at these points. The coronary arteries were dilated and the seat of a nodular sclerosis. The main anterior papillary muscle of the left side was opaque, grayish-white in color and sclerotic, and the underlying ventricular wall presented a similar sclerotic appearance.

Microscopical sections of tissue taken from these areas show a partial disappearance of the muscle fibers and considerable atrophy of the fibers still remaining, and a corresponding new growth of fibrous tissue not very rich in cells.

The right pleural cavity was partly obliterated by old fibrous adhesions, but where the layers were not grown together a sero-fibrinous exudate had collected. The visceral pleura was covered with a thick fibrinous layer, quite adherent, and on the separation of which small red granulations were brought to view. The left pleural cavity likewise contained an exudate presenting the same characters ; it was, however, more extensive and the lung was compressed.

The peritoneal cavity contained 2000 cc. of yellow serum, and between the loops of intestine stringy fibrinous masses occurred. In the floor of the pelvis there was a thick, grayish-yellow, somewhat softened fibrinous mass, slightly adherent to the peritoneum, the surrounding vessels being injected and prominent.

Both kidneys were small and granular, together weighing only 150 grams. The average thickness of the cortex was 2.5 mm. Frozen sections from these organs showed great atrophy and disappearance of the glomeruli and tubules associated with a new growth of fibrous tissue. In the glomeruli which remained fat droplets were present, and the epithelium of the convoluted tubules still present was fatty and disintegrated.

Cultures from the exudate in the pericardium, pleura and peritoneum showed the organism associated with the acute processes to be the streptococcus pyogenes In the peritoneal cavity cultures from the thick fibrinous mass in the floor of the pelvis gave in addition a bacillus which proved to be the B. coli communis. The lungs also gave a pure culture of the streptococcus notwithstanding there were no foci of acute pneumonia. The spleen and bile were sterile. Cover-slips from the softened right hemisphere showed very few organisms.

In conclusion I desire to direct attention to this case as being

another example of a class of infections of which in the last two years several cases have been brought before you, where in the course of chronic kidney and heart affections the terminal event is an acute inflammation of the serous membranes. Sometimes in these cases as we pointed out on a previous occasion, organisms which do not under ordinary circumstances possess marked pathogenic properties may be the cause of the acute processes, whereas in others, as in the present example, well-marked pathogenic species may exist in association with the lesions. Moreover, in some cases, no avenue of entrance of the infective organisms into the body can be demonstrated, whereas in others the place of ingress can readily be made out. You will recall that in one instance a small tuberculous ulcer of the intestine was the mode of entrance of the proteus vulgaris into the peritoneal cavity in acute peritonitis, and in the present case, in the secretion from a bed-sore over the promontory of the sacrum streptococci were demonstrated.

Note on the Significance of Taches Bleuâtres.—DR. HEWETSON.

I have been asked by Dr. Osler to show this patient, on whose skin the so-called peliomata or taches bleuâtres are seen with unusual distinctness. The chief reason we have for showing the case is that there has existed a considerable difference of opinion regarding the diagnostic value of these spots. Many writers, and particularly the English, have believed that they are often seen in the early stages of typhoid fever, and have laid some stress upon their presence, although they admit their occasional occurrence with pediculi. Other observers, especially the French, claim that they do not exist unless pediculi, and more particularly the pediculi pubis, are present; that when the taches bleuâtres are present in typhoid fever, these pediculi or the nits can always be found if looked for carefully. Our experience leads us to believe that the latter view is correct, as in the several cases of typhoid fever where these peliomata were present, we were able in each instance to find either the pediculi or their nits. There have also been several cases, other than typhoid fever, in which these grayish-blue spots were found, but always associated with pediculi. We have at the present time two cases in the wards, this patient who is suffering from catarrhal jaundice, and another admitted for chronic bronchitis and emphysema. In neither case is there any elevation of temperature, but in both there are numerous steel-gray spots scattered over the abdomen, thorax, inner sides of thighs, and here and there present on the arms and legs. In both instances the pediculi are numerous, particularly over the pubes, but also in the hair over the various sites where the taches bleuâtres are present. In both cases they are quite plentiful in the axillæ, but in neither have they been found on the hairs of the head or face. They do not appear to have caused much irritation, neither patient complained of itching, nor are there marks of much scratching. Indeed, I find that this patient, formerly an Austrian soldier, is quite indignant at our having removed both hair and pediculi. He tells me that they are considered as bringing luck to the bearer, and each sells for from 5 to 10 kreuzers among the soldiers. They had been carefully carried by him for ten years.

Crocker states that "Morrison in 1868 wrote concerning the finger-nail-sized, steel-gray spots of pigmentation (maculæ ceruleæ, taches ombrées) which are frequently seen deep in the epidermis of the affected areas. Duguet in 1880–82 showed that this pigment was contained in the thorax of the animal, opposite the anterior pair of legs, where there are known to be two pairs of salivary glands, and it is probable that the secretion is conveyed into the tissues through the haustellum. Jamieson thinks that the stains have some anæsthetic effect as far as the itching is concerned." In this patient the taches bleuâtres stand out plainly against the somewhat jaundiced skin, and, as can be seen, are most numerous in those positions in which the pediculi were most abundant. The pigmentation seems to disappear after the skin containing it has been pinched for some few seconds.

HOSPITAL JOURNAL CLUB.

Meeting of December 8, 1893.

Abstract of Küstner's Treatment of Inversion of Puerperal Uterus.—DR. ROBB.

In the *Centralblatt für Gynaekologie*, October 14, 1893, Otto Küstner, of Dorpat, suggests a new operation for the conservative treatment of old-standing inversion of the uterus, where the simpler methods have failed, in preference to laparotomy and dilatation through the abdominal wound, or any of the mutilating operations. He calls his article "A conservative method of treatment for intractable inversion of the puerperal uterus."

The following is a short abstract: In cases of old-standing inversion of the uterus, where the bimanual method of reinversion has failed and the simple or modified method by means of the kolpeureter of Koch has not succeeded, it may be necessary to try other operative measures if: (1) the hemorrhage is extensive; (2) if the condition of the patient will be serious if the inversion is allowed to remain. In such cases we resort to laparotomy, followed by direct dilatation of the stricture with the finger or instrument by way of the abdominal wound; or, if such procedures were not successful, up to the present time we have had to resort to some of the mutilating operations: (1) castration; (2) amputation of the inverted body of the uterus; (3) total extirpation of the organ.

He discusses Thomas's operation, viz., laparotomy with dilatation of the stricture and bimanual reposition. He objects to this because, however much we dilate the stricture, it is always too small as soon as we attempt reinversion, especially as the funnel-shaped passage through which the womb has escaped is always getting smaller and the uterus larger on account of venous stasis. He therefore suggests a surgical operation—surgical indeed, but not "mutilating,"—which he has tried with success, and which he hopes will either do away with or limit the number of mutilating operations.

He reports a case of a woman 19 years old, who (it was said) had inversio uteri because the midwife had pulled upon the cord in delivering the placenta. Several efforts at reinversion had proved fruitless. Bleeding had been so great that the woman began to suffer from various psychoses due to the anæmia. Finally he resorted to the following operation: He seized and brought down the uterus so that it lay in the vulva, then made a broad transverse incision in Douglas' sac, through which he passed the left index finger into the constriction and pushed the inverted uterus down through the vulva. He next attempted, while keeping the fingers in the constriction, to invaginate the uterus with the thumb, but without success. He then, keeping his left index finger in the constriction, cut through the mucous surface of the posterior wall of uterus near the internal os, the incision being 2 cm. long, after which he replaced easily and retroflexed strongly the reinverted uterus, and finally having brought the wound in the uterus down to that in Douglas' sac, sewed up first the former and then the latter.

To sum up the operation: (1) Transverse broad incision of Douglas' sac; (2) inserting through this the finger, which is then turned and passed through the constriction (in this way adhesions from peritoneum could be broken up); (3) incision in posterior wall of uterus, longitudinal, as near in middle as possible, being 2 cm. below fundus, ending 2 cm. above external os; (4) reinversion of uterus by means of index finger in constriction point, and invagination by means of the thumb; (5) suture of wound in uterus from peritoneal side with deep and superficial sutures; (6) sewing up of the wound in Douglas' sac.

The opening of Douglas' pouch so that the finger can be inserted into the constriction has many advantages, but this probably will not be enough. The incision to relieve the beginning stricture should be made not from the peritoneal surface but from the mucous membrane of the inverted uterus, the stitches being put in from the peritoneal surface. This he thinks much preferable to bimanual attempts at reposition or mutilating operations.

HOSPITALS, DISPENSARIES, AND NURSING,

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[*Transactions of Section III, International Congress of Charities, Correction and Philanthropy, held in Chicago, June 12th to 18th,* 1893.]

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JOHN ARDERNE AND EARLY ENGLISH MEDICAL WRITERS.

By John S. Billings, M. D., *Surgeon U. S. A.*

[Read before the Hospital Historical Club, Feb. 12, 1894.]

Dr. Billings spoke of the early surgical literature of England, including the Leechbook, printed as Volume II of "Leechdoms, Wortcunning and Starcraft of Early England," the surgical references in the book of the Physicians of Myddvai and the works of Arderne, Vicary, Gale, Clowes, and Lowe. He showed a manuscript volume of the works of John Arderne, recently acquired by the Library of the Surgeon-General's Office, through Mr. Thomas Windsor, the well-known bibliographer, of Manchester, England. This manuscript, which is supposed to date from about 1400 A. D., is imperfect, beginning at folio 41 and ending at folio 139. The Latin is very difficult to make out, as the writer seems to have had a system of ligatures and contractions of his own. There are some writings and drawings upon the margins, mostly illustrating cases of fistula.

The following memorandum by Mr. Windsor gives what is known of his life, and a summary of the contents of the manuscript.

Biography of John Arderne.

All that is really known is that he was born about 1308,[*]

practised in Wiltshire, MS f. 54, "hoc probavi in Vicecomite Wilteshure," and abroad, MS f. 49, "hoc probavi uno Rege et duobus Episcopis in transmarinis partibus," and afterwards at Newark, in Nottinghamshire, from 1349 to 1370, when he removed to London, where he wrote his treatise on fistula in 1376,[*] and his "Cura oculorum" in 1377.[†]

It has been supposed or asserted that he was admitted at Montpellier and that he practised in France as a military surgeon (Häser: Lehrb. d. Gesch. d. Med.), that he practised at Antwerp (E. H. in his transl., Sloane, II, 271), that he was at the battle of Crecy (E. Milward in a . . . letter . . . concerning . . . British physiol. & chyrurgical authors), and that he was surgeon to Richard II and Henry IV (W. Beckett in Philos. Trans. V, 30, p. 842).

I am not aware that any of these statements can be proved;

manu me. . . exaravi apud London anno. vi. . . regal regs Ric. 2 prima et etatis meae lxx." In one MS before me he says (f. 61, r) "Ego Johannes praedictus a prima pestilencia quae fuit anno dom. 1349 usque annum dom. 1370 moram traxi apud Newerk in Corn. . . . (f. 62, r) Postea anno dom. 1370 veni London et ibidem curavi . . ."

[*] Sloane, 341. " Ego Joannes . . . us Arderne . . . hunc libellum anno. . . . & utilitatem & . . . sanitatis humaae . . . vit . . . qui plurepe Pluves . . . Warin . . . . reges migravit ad . . . . die S. Trinitatis vi idus Junii."

[†] 1st year of Richard II.

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[*] Brit. Mus. Sloane 75, fol. 146. After saying that his eyes had become much weakened from study and writing up to the 70th year of his age, ' e says : " Et sciant presentes & futuri quod ego magister Johannes ae Ardern chirurgicorum nummus hunc libellum propria

it may also be noted that he would be about 91 when Henry came to the throne. It may be mentioned that III, 548 Sloane ends "explicit practica Henrici Ardern," and in the Hunterian Library, Glasgow, there is a MS by Johannes Arderon "de judiciis urinarum," written apparently after the time of Henry the 4th.

I may just mention that the MSS in the British Museum are almost invariably imperfect.   THOMAS WINDSOR.

CONTENTS OF MANUSCRIPT OF JOHN ARDERNE'S WORKS.

f. 41. Contra colicam et iliacam passionem. Modus ministrandi clysteria.

f. 43. Contra dolorem lumborum et renum. Contra lapidem in renibus.

f. 44. Contra ulcerationes vesicæ vel renum.

f. 45. Confectio olei nardini. Regimen nephrecticorum.

f. 46. Provocans vomitum.

f. 47. Contra saniem mingentes. Confectio olei amigdal. Contra ardorem urinæ et excoriationes virgæ infernis.

f. 48. Contra Shawedepisse (in other MSS Chawdepisse). Scolopendria.

f. 50. Contra lapidem.

f. 52. Contra inflammationes virgæ vel vulvæ.

f. 53. Contra ulcera sub præputio.

f. 55. Contra inflationes testiculorum.

f. 57. Contra lacrimas & ruborem oculorem, etc. Modus purgandi.

f. 61. Cases of fistula ani.

f. 63. Behaviour of surgeon.

f. 67. Argentum vivum.

f. 68. Apostemata in ano.

f. 74. De restrictione sanguinis.

f. 76. Ung. Arabienum   Signum perfectæ curitionis.

f. 81. Bubo est apostema infra anum in longaone. Various cases of fistula and other affections of the anus.

f. 85. Pulvis greens. Oleum rosarum. For to make oyle of roses (in English).

f. 86. To make a gode salve for a wounde (in French).

f. 87. Ad clarificandum visum.

f. 88. Confectis pulveris sine pare. Regula de crebra remocione plagarum.

f. 90. Plaga propanda facta cum cultello vel sagitta.

f. 95. Repercussion simplicia.

f. 97. Morsus canis rabidi.

f. 99. Contra emorroides (gives a list of authors made use of).

f. 104. Cauterizantia.

f. 107. For the emorodes.

f. 120. Curitio virgæ inflatæ & calidæ cum rubore.

f. 130. Cura apostematum in genu.

f. 131. Cura apostematum in tibia.

f. 132. Inomodo cognoscitur caro mortua.

f. 133. Contra malum mortuum.

f. 139. Contra &c. in digitis.

TITLES OF WORKS ON SURGERY SHOWN BY DR. BILLINGS.

Thomas Gale : The institution of chyrurgerie. London, 1567. **T.**

Franciscus Arceus : A most excellent and compendious method of curing woundes in the head, and in other partes of the body, with other precepts of the same arte. Translated by John Read. Whereunto is added the exact cure of caruncle, with a treatise of the fistulæ in the fundament, and other places of the body, translated out of Johannes Ardern. And also the discription of the emplaister called Dia Chalciteos, [etc.]. London, 1588. **D.**

John Halle : A most excellent and learned woorke of chirurgerie, called chirurgia parua Lanfranci, Lanfranke of Mylayne, his briefe : reduced from dyuers translations to our vulgar or vsuall frase, and now first published in the Englyshe prynte by John Halle chirurgien, who hath therunto necessarily annexed a table, as wel of the names of diseases and simples with their vertues, as also of all other termes of the arte opened. Very profitable for the better understanding of the same, or other like workes, and in the ende a compendious worke of anatomie, more vtile and profitable, then any here tofore in the Englyshe tongue publyshed. An historiall expostulation also against the beastly abusers, both of chyrurgerie and phisicke in our tyme : With a goodly doctrine, and instruction, necessary to be marked and followed of all true chirurgiēs. All these faithfully gathered, and diligently set forth, by the sayde John Halle. London, 1565. **D.**

William Clowes : A profitable and necessarie booke of obseruations, for all those that are burned with the flame of gun powder, etc., and also for curing of wounds made with musket and caliuer shot, and other weapons of war. Last of all is adioined a short treatise, for the cure of lues venerea, by unctions and other approoued waies of curing, heertofore by me collected : and now againe newly corrected and augmented in the yeere of our Lorde 1596. London, 1596. **O.**

Peter Lowe : A discourse of the whole art of chyrurgerie ; Wherein is exactly set downe the definition, causes, accidents, prognostications and cures of all sorts of diseases, both in generall and particular, which at any time heretofore have beene practised by any chyrurgion ; according to the opinion of all the ancient professors of that science. Which is not onely profitable for chyrurgions ; but also for all sorts of people : both for preventing of sicknesse and recoverie of health. Whereunto is added the rule of making remedies which chyurgions doe commonly use, with the presages of Divine Hippocrates. 3. ed. London, 1634. **D.**

The physicians of Myddvai ; Meddygon Myddfai ; or, The medical practice of the celebrated Rhiwallon and his sons, of Myddvai, in Caermarthenshire, physicians to Rhys Gryg, Lord of Dynevor and Ystrad Towy, about the middle of the thirteenth century. From ancient Mss. in the libraries of Jesus College, Oxford, Llanover and Tonn ; with an English translation and the legend of the Lady of Llyn y Van. Translated by John Pughe, and edited by the Rev. John Williams Ab Ithel. Llandovery, 1861. **O.**

Memorials of the craft of surgery in England. By John Flint South, edited by D'Arcy Power, with introduction by Sir James Paget. London, 1886. **O.**

Leechdoms, wortcunning and starcraft of early England. Being a collection of documents, for the most part never before printed, illustrating the history of science in this country before the Norman conquest. Collected and edited by the Rev. Oswald Cockayne, M. A. Cantab. Vol. II. London, 1865. **Q.**

IN MEMORIAM.

Hon. CHARLES JOHN MORRIS GWINN.

The Honorable CHARLES JOHN MORRIS GWINN, one of the Trustees of the Johns Hopkins University and the Johns Hopkins Hospital, died at his residence in Baltimore, Sunday, February 11, 1894, in his seventy-second year. The funeral was attended on the following Tuesday, and his body was buried in Greenmount Cemetery.

ACTION OF THE TWO BOARDS OF TRUSTEES.

A joint meeting of the Trustees of the two institutions was held at the University, Monday, February 12, when the following minute and resolutions were adopted unanimously:

Minute.

In founding and administering institutions as complex as this University and this Hospital, there are many parts and many actors. One contributes capital, another suggestion, another experience, another learning and another counsel. The resultant of all these forces is the progress of the undertaking, which, according to their adjustment, may be slow or quick, irregular or steady, disheartening or inspiring.

In the organization and development of the Johns Hopkins foundations the Hon. Charles J. M. Gwinn has been from the beginning a counsellor. It is never to be forgotten that his pen drafted the instruments by which both the Hospital and the University were created, and that in no small degree it is due to his wise foresight that the fundamental articles of both institutions were kept free from those needless restrictions and those embarrassing requirements which often fetter the noblest plans.

With Francis White and the late Francis T. King he was an executor of the will of Mr. Hopkins. He was an original member of both boards, and on the death of Judge George William Brown, in 1890, he succeeded in the University board to the important office of chairman of the executive committee.

His eminence as a lawyer caused him to be the counsellor upon whom both boards relied for legal advice. He never encouraged litigation, but always sought for conciliatory action. In the art of exact and discriminating expression he was remarkably successful, and nothing seemed to give him more pleasure than to reduce to an acceptable form the conclusions reached by his colleagues upon difficult or controverted points. His attendance upon the meetings of the Trustees during a period of nearly twenty years was regular and punctual, and when absent he rarely, if ever, failed to send a written apology. His manners were dignified and courteous; his language was graceful and seasoned with wit. He earnestly advocated the admission of women to the Johns Hopkins Medical School upon exactly the same terms as men, and he drafted the papers by which this result was reached. Under all circumstances he was in favor of maintaining high standards of education and scholarship.

A man of noble mien, of great natural ability, of liberal education, of wide reading in literature, history and jurisprudence, he naturally came into varied and confidential intercourse with the leaders of public opinion in politics and in law, while his abilities as a counsellor were recognized not only by his colleagues, but by the public, who called him repeatedly to stations of dignity and responsibility.

His name is sure to be remembered in the annals of the two foundations to whose interests he was thoroughly devoted.

Resolutions.

Whereas it has pleased Almighty Providence to remove our friend and colleague, the Honorable Charles John Morris Gwinn: Be it

Resolved, That we here record our admiration of his brilliant talents, our appreciation of his constant and efficient services to those institutions with which he has been honorably connected from their foundation, and that we tender our expressions of sincere sympathy and condolence to his family in this hour of their bereavement and trial.

Resolved, That a copy of the foregoing minute and resolution be transmitted to the family of Mr. Gwinn.

Resolved, That the members of the two boards will attend the funeral in a body.

Remarks in respect to the character and services of Mr. Gwinn were made by several of his associates. Among others, Dr. James Carey Thomas spoke substantially as follows:

"I cannot forbear the expression in a few words of my sense of the great loss that this University has sustained in the death of Charles J. M. Gwinn. In common with those who shared the responsibility of the inception and development of the University, he constantly watched with satisfaction its increasing influence upon the country as well as upon this community. Mr. Gwinn's interest in the affairs of the University deepened with each year of its successful progress, and he became more and more devoted to its service. We can hardly realize at this time that the sudden removal by death of our friend and fellow-trustee, in the midst of his mental activity and usefulness, will henceforth deprive us of his valuable counsel and help."

BIOGRAPHICAL SKETCH.

The following statement of the principal dates in the life of Mr. Gwinn were brought together immediately after his death and printed in the Baltimore *Sun* of February 12, 1894.

Mr. Gwinn was born in Baltimore, October 31, 1822. His father was a merchant and importer of West India produce. His early education was received in the schools of Baltimore. He was at one time a student at the University of Maryland in the general educational work which that institution then conducted.

From Princeton College Mr. Gwinn was graduated in 1840 with high honors. Upon his return to Baltimore he studied

law with the late John H. B. Latrobe, and was admitted to the bar in 1843.

In 1849 he was a member of the Maryland House of Delegates, and in 1850 he was a delegate from Baltimore to the Constitutional Convention which framed the constitution of 1851. Mr. Gwinn was the first State's Attorney of Baltimore elected under that constitution. The election took place in 1851, and Mr. Gwinn was the Democratic candidate. His opponent on the Whig ticket was Mr. S. Teackle Wallis. The term of office was four years, and Mr. Gwinn declined a renomination.

He was one of the presidential electors on the Democratic ticket in 1852. This was the campaign in which President Pierce was elected. Near the close of Mr. Pierce's term Mr. Gwinn was sent to Europe on a special diplomatic mission for the national government.

From 1856 to 1875 Mr. Gwinn devoted his time to the practice of his profession. During this period he became, in conjunction with Mr. John H. B. Latrobe, the leading counsel of the Baltimore and Ohio Railroad Company. Mr. Gwinn was counsel for the banking house of Robert Garrett & Sons and for the late A. S. Abell and the late Johns Hopkins. Later Mr. Gwinn became general counsel in Maryland of the Western Union Telegraph Company and the Chesapeake and Potomac Telephone Company.

From the time when he drafted the will of Johns Hopkins, Mr. Gwinn became closely allied with the establishing of the Johns Hopkins University and Johns Hopkins Hospital. He was named as one of the first trustees of both institutions, and held the position until his death.

In the campaign of 1875 Mr. Gwinn was again pitted against his former opponent, Mr. S. Teackle Wallis. Mr. Gwinn was then candidate for attorney-general on the Democratic ticket headed by John Lee Carroll for Governor. Mr. Wallis was the independent candidate for attorney-general. Mr. Gwinn secured the prize, and upon the expiration of his term of four years was re-elected in 1879, when William T. Hamilton was elected Governor.

The assistance of Mr. Gwinn was given and his advice relied upon in framing the national platforms and conducting the national campaigns of the Democratic party in 1876, 1880, 1884 and 1892. He was a delegate to the national conventions of the party in 1860, 1868, 1880, 1884 and 1892. He was usually called upon to represent the Maryland delegation on the committee on platform.

In 1857 Mr. Gwinn married Miss Matilda Johnson, daughter of the late Hon. Reverdy Johnson, who, with one daughter, survives him.

ASSOCIATION OF PROTEUS VULGARIS WITH DIPLOCOCCUS LANCEOLATUS IN A CASE OF CROUPOUS PNEUMONIA.

By WALTER REED, M. D., *Surgeon, U. S. A., Curator Army Medical Museum.*

I am indebted to Surgeon J. K. Corson, U. S. Army, for the following brief and somewhat incomplete history.

S. H., age 28, soldier, of good physique, was under treatment in the Post Hospital, Washington Barracks, from December 1 to December 9, 1893, with diagnosis of tertian intermittent fever. He was readmitted to hospital at 2.30 p. m., December 10, 1893, with a chill and a temperature of 104°. He had a dry cough and complained of slight pain in right chest. Physical examination revealed nothing of importance, so that the diagnosis of influenza seemed appropriate.

The morning after admission, following a restless night, his temperature was 105.2°. There was nausea and slight cough. At evening, under the administration of an antipyretic, temperature was 104°. During the 12th, 13th and 14th fever continued, varying from 103.8° in the morning to 106.2°, which was registered at 9 p. m. on the 14th; this, notwithstanding the administration of quinine and other antipyretics. December 15th (sixth day of attack) patient was expectorating a small quantity of tenacious sputum, slightly blood-tinged, and there was dullness over base of right lung; a. m. temperature 104.4°, p. m. temperature 103.4°. Signs of lung consolidation not well developed at any time during illness. The patient's pulse, which was rapid and wiry in the beginning, changed at this time to a rapid and extremely feeble pulse, and as there were well-marked signs of impending collapse, hypo-

dermics of brandy were freely administered. Treatment had been supporting and stimulating throughout. Delirium, alternating with stupor, which had been an early symptom, now gave way to more pronounced stupor. Temperature continued high, 104°–104.8°. Death at 4.25 p. m., December 18, 1893. Duration of attack, eight days.

December 16 (seventh day) I received a small quantity of the patient's sputum. This was tenacious and faintly rusty in color. Cover-slips stained by Gram's method showed a few diplococci without capsular staining. The same date 0.5 cc. of this sputum was introduced beneath the skin of a rabbit.

Soldier's autopsy was held 17 hours after death. I am informed that examination was confined to the lungs, and that the only lesion found was consolidation of the lower lobe of the right lung; the remainder of this lung and the entire left lung were normal. I secured a portion of the pneumonic lobe thirty minutes after the autopsy had been made. This embraced the pleural surface and measured 12x8x2 cm. It was solid and had a succulent appearance. Numerous fine granular projections were seen rising from the surface. Its color was reddish-gray on fresh section. The pleura was covered with a delicate layer of fibrin, which, being scraped away, left a dull, gray, lustreless surface. Cover-slips by Gram's method gave here and there what appeared to be characteristic diplococci; in one field three pairs were seen.

The pleural surface was burned, and in the hurry of class-work a culture was taken on an agar slant. Portions of lung were placed in alcohol.

At the end of twenty hours, at 37° C., almost the entire surface of the slant was covered by a moist, grayish-white layer. Cover-slips examined in water gave short, motile rods. Agar plates were now made. At the end of twenty-four hours, at 37° C., numerous small, white, deep colonies, as well as larger spreading surface colonies; no colonies resembling diplococcus l. could be found with low power. The culture appeared to be pure. Cultures from several separate colonies were taken, and these grown upon 5 per cent. gelatine gave colonies with numerous amœba-like processes. The medium was rapidly liquefied. Grown on agar, in gelatine stabs, gelatine rolls, potato and glucose bouillon, no difference could be detected between this organism and a culture of proteus vulgaris obtained through the kindness of Dr. Theobald Smith of the Agricultural Department.

Sections of the lung stained with hæmatoxylin and eosin show the contents of certain alveoli to consist of a large number of red corpuscles, fewer polynuclear leucocytes and epithelioid cells held in a network of fibrin; other alveoli contain numerous polynuclear leucocytes and fewer epithelioid cells with fibrin network. The presence of epithelioid cells together with pigment-holding cells would lead to the supposition that the patient had chronic heart disease. Sections stained with Gram show numerous diplococci. With a view of finding proteus, sections have been stained with methylene blue and eosin and with aqueous solutions of fuchsine. After patient search of many sections a well-marked clump of short bacilli with distinct outlying short rods were found in one instance on a section stained with fuchsine. Further search revealed several small clumps and one short chain, which consisted of bacilli corresponding in size to proteus v., in a section stained with methylene blue and eosin.

To return to the rabbit which had been injected with the sputum on the 16th inst. On the 19th, 20th and 21st the animal appeared to be quite sick, but was better on the 22d, except for loss of weight, which was perceptible. This loss of weight continued from day to day, although the animal took its food as usual. December 31 rabbit died. Autopsy 10 a. m. same day. Emaciation extreme. All organs normal; but little food in stomach. Cultures were taken from blood, liver, spleen and kidney. Cover-slips from the same sources were negative. At the site of the injection there was found an abscess larger than an English walnut, with fluid, creamy contents; its walls were infiltrated with a white caseous material. Cover-slips from the abscess showed numerous polynuclear leucocytes and many short and long rods. Esmarch rolls (agar) were made from the abscess. At the end of 24 hours, at 37° C., cultures from the organs were negative, while that from the abscess showed numerous colonies of an organism which, studied after the usual methods, proved to be proteus vulgaris.

I am aware that this case is a very incomplete one in many respects, and that the omission to take cultures from all the organs of the patient was, in the light of subsequent events, much to be regretted. The attending physician having suspected meningitis as a complication, it was an oversight not to have opened the skull-cap and taken cultures from that cavity. But when one reflects that up to date, so far as I can learn, no human autopsy has ever been studied bacteriologically at the national Capital, I may felicitate myself that I have even been permitted to inject a small quantity of the patient's sputum beneath a rabbit's skin, and have had the opportunity of taking cultures from a portion of the affected lung. Notwithstanding its incompleteness, when we take into consideration the finding of proteus on culture from the lung, the same organism in an abscess of a rabbit produced by the inoculation of sputum of this patient, and the presence of short rods in the lung sections, I believe that we may feel positive that there was in this lung a mixed infection, viz. the association of proteus vulgaris with micrococcus lanceolatus. Which organism is entitled to precedence, whether proteus prepared the way for the diplococcus lanceolatus, or whether it was added to an already established infection by the latter organism, one cannot say. The marked hebetude, approaching the comatose condition, as far as my personal experience goes, is not an early symptom of croupous pneumonia. And, furthermore, if we are to judge by physical signs, this patient, who sickened on the 10th, did not develop lung inflammation until the 15th. According to Booker, extensive observations have led him to the conclusion that proteus plays an important part in the production of the morbid symptoms which characterize cholera infantum. He states that the prominent symptoms in cases of cholera infantum in which the proteus bacteria have been found are drowsiness, stupor, emaciation, more or less collapse, frequent vomiting and purging, with watery and generally offensive stools. Nausea and rapid pulse, marked stupor and tendency to collapse were prominent symptoms in the case which I have reported.

Professor Welch (*Bulletin of the Johns Hopkins Hospital*, Vol. III, No. 27) says that Monti made the interesting observation that the impaired virulence of the diplococcus lanceolatus can be restored by injecting with the cultures into rabbits the products of the proteus vulgaris or other common putrefactive bacteria. He remarks that these observations merit further investigation. In this connection experiments have been instituted in the laboratory of the Army Medical Museum, and later on the result of these investigations will be published.

FATTY DEGENERATION OF THE HEART MUSCLE.

By Simon Flexner, M. D., *Associate in Pathology, the Johns Hopkins University.*

The occurrence of fatty degeneration of the myocardium in certain diseases in human beings is even at this time questioned by some authors. Krehl,* in a recent paper, endeavors to prove that there is only one condition, namely, phosphorus poisoning, in which fatty degeneration of the heart can be said to occur with sufficient regularity or in such amount as to be of significance. The autopsy reports of this hospital contain a considerable number of cases which may be regarded as bearing directly on this disputed question, and I have brought them together with this in view. Moreover, in the course of experiments carried out on animals, examinations were made with reference to the occurrence of fatty degeneration in the organs.

Although most of the significance attached to this condition by the older writers, especially Quain and Stokes, has passed away, and lesions of a very serious nature which were ascribed to fatty degeneration of the heart are now known to be caused by other agencies, yet the subject is not without interest.

Wagner† pointed out long since that the anæmic heart presented so many of the gross characters of the fatty heart that deception was very easy. In his analysis of 2000 cases, including a variety of affections, he classified them accordingly as on microscopical examination one-fourth, one-half, nearly all, or all the heart fibres were fatty, into slight, moderate, and severe grades. Considering the frequency of its occurrence, he regarded the slight interest which most physicians showed in it as remarkable, and he accounted for it on the ground that, contrary to other conditions of the heart, it was not capable of detection by percussion and auscultation; moreover, that it almost invariably occurred as a secondary affection.

Our examinations have comprised 170 cases, representing a number of different affections in human beings. All the diagnoses were based on microscopical examinations, and never referred to the gross appearance of the organs alone. The classification which I have adopted is essentially that given by Wagner, and subdivides the degree of fatty degeneration into three groups. The first contains those cases in which a few fibres were fatty, or, if more showed fatty change, the individual fibres contained only few fat droplets. In the second more fibres were affected and the fat in the separate fibres was greater. In the third group all the fibres, or nearly all, contained fat, and often in such large amount that the striation of the fibres was either greatly obscured or lost.

The results of experiments on animals have been treated in a similar manner. Naturally, the conditions which have been studied in these are more restricted than the observations on human beings. They have one advantage over the latter. The length of time which the animals survived the inoculations is in every case known. This fact is important in its bearing on the time required for the development of the changes in the heart muscle.

It is proper to state that in the great majority of cases, but not in all, the animals used were not kept in long confinement in the laboratory under questionable hygienic conditions prior to the inoculation. As a rule, the animals were purchased only a short time before, and were kept under observation for a few days before inoculation, to determine, as far as possible, their healthfulness. Moreover, they were, without exception, in a good state of nourishment and seemed active and well. The operation of secondary causes was, it is believed, excluded to a large extent by the bacteriological study of the cases for the purpose of excluding cases of mixed or secondary infection.

The clinical bearing of the cases reported in human beings is, as a rule, omitted. The reason for this is not because it is believed, *a priori*, that no relation may be found between the condition or degree of fatty degeneration and the clinical picture. Perhaps this aspect of the question may be considered at another time. The object has been to indicate in what class of cases, so far as this material enables one to decide, a pathological increase in the fat in the heart muscle occurs and in what proportion of cases.

On the other hand, we have observed three cases in which such extensive fatty changes in the parenchymatous organs were present that they formed the chief recognized pathological condition at the autopsy. These cases will be given by themselves, with some facts from the respective clinical histories and autopsy records.

Concerning the ability of the microscopical examination to give a trustworthy indication of the extent of the fatty change there is some difference of opinion. Krehl* maintains that the examination of bits of the heart muscle in this way does not suffice for a conclusion. He has brought forward what he regards as strong evidence of the insufficiency of this method, and he strongly recommends the chemical examination.

As valuable as the results of the chemical examination are—and his results are of great interest—it is questionable whether he maintains the point. A considerable part of the heart's substance must be sacrificed in order to obtain portions of tissue from which adipose tissue is absent, and at best only larger pieces of tissue can be utilized for this purpose—larger than are chosen for the microscopical examination. And as Goebel† has pointed out, the sub-pericardial layer must in all cases be sacrificed, and in this layer the heart muscle shows often the most exquisite degeneration.

But his statement that in the majority of instances the fat is found in foci in the heart, and therefore conclusions based on the microscopical examination will be influenced greatly by the chance of the portion examined, which will be equally erroneous if, as in the case of the examination of such a fatty focus, the result be generally applied, as if the contrary should happen, is open to question. It is often, as Goebel‡

* Deutsches Archiv f. klin. Medicin, Bd. 51, S. 417.
† Die fettige Metamorphose des Herzfleisches.

* *Loc. cit.*
† Central. f. allg. Path. u. path. Anat., Band IV, S. 721.
‡ *Loc. cit.*

has stated, the case that the fat seems, at first, to be focal in distribution, but closer examination will show that this distribution is only apparent. Among the foci of relatively or severely fatty degenerated areas are places of somewhat slighter change which often unite the whole.

The examinations which we have made consisted in the study of sections prepared as a rule from the wall of the left ventricle, and commonly including the entire thickness of the wall of the ventricle. Often, in addition to this, pieces from the right ventricle and from the papillary muscle of the left ventricle were also examined. The tissues were, almost without exception, examined in the fresh state. This method, with the exception of the use of osmic acid in one of its forms as a fixing and staining agent, is the only reliable one. There is little or no reliance to be placed upon the results obtained from the study of the tissues hardened in Müller's fluid or alcohol. The fat is entirely extracted, and the spaces or "holes" left behind, even if they were always recognizable, cannot be interpreted with certainty.

TABLE I.—SUMMARY OF AUTOPSIES AT THE JOHNS HOPKINS HOSPITAL.

Principal Disease.	Total number of cases.	Number of cases not fatty.	Number of cases fatty.	Degree of fatty degeneration.		
				Very.	Moderately.	Slightly.
Primary valvular lesion of heart.......	2	..	2	..	2	..
Same with acute exacerbation..........	8	3	5	1	4	..
Arterio-sclerosis with sec. heart lesion..	21	14	7	2	3	2
Typhoid fever.......................	14	6	8	2	1	5
Acute lobar pneumonia................	10	5	5	..	1	4
Anæmia.........	10	3	7	3	4	..
Septicæmia and pyæmia...............	17	6	11	3	5	3
Acute peritonitis	16	3	13	5	6	2
Tuberculosis of lungs with and without intestinal tuberculosis	22	14	8	4	..	4
Acute miliary tuberculosis. (No lung tuberculosis)....	1	..	1	..	1	..
Chronic nephritis, large kidneys.......	2	1	1	..	1	..
Chronic nephritis, small kidneys......	4	1	3	1	..	2
Cirrhosis of liver.....................	3	1	2	1	..	1
Tuberc. pericard.....................	2	1	1	..	1	..
Acute enteritis and colitis.............	5	2	3	..	2	..
Amœbic dysentery	3	..	3	3	..	..
Emphysema of lungs..................	2	..	2	..	1	1
Carcinoma	10	4	6	2	2	2
Extensive burns	3	..	3	3	..	..
Pseudo-leucocythemia.................	2	1	1	..	..	1
Diabetes	1	..	1	..	..	1
Cholelithiasis	1	..	1	..	1	..
Myelitis............................	1	1	..	..	..	..
Coal-gas poisoning	1	..	1	..	..	..
Fat necrosis of pancreas..............	1	1	..	..	..	..
Syphilis............	2	1	1	1	..	..
Leucocythemia.......................	1	..	1	..	..	1

There are some facts with reference to the accompanying table which call, perhaps, for a few words of explanation. In classifying the diseases the effort was made to separate the cases in respect to the exciting causes of the fatty degeneration. For example, the cases of chronic heart disease in which acute inflammatory processes of infectious origin were present at death are put in a table distinct from those in which this complication was absent. While the acute infections are not in

these cases urged as the cause of the fatty change, yet in view of the known efficacy of this factor in bringing about such alterations it seemed desirable to group them together. The failure to make such a distinction by other writers may in part account for the discrepancies observed.

The class of pyæmia and septicæmia embraces both extensive local suppurative processes, as for example joint affections, and cases of general infection with the pyogenic staphylo- and streptococci, with and without definite abscesses in the tissues.

It is understood that any classification can take into account only the principal disease processes. Most autopsies are an ensemble of pathological conditions, and one stands often in doubt before cases of chronic liver and kidney disease which have come to rapid termination through some acute infectious process. In such instances which of the conditions is to be ranked as the principal disease?

The cases grouped under the head of anæmia are likewise of varied character. This group includes a case of death following hemorrhage from the stomach in gastric cancer; other severe anæmias following operations, and especially three cases alluded to in which the degree of fatty degeneration was so marked and embraced all the parenchymatous organs that it formed the principal pathological condition at the autopsy. These cases are given briefly.

B. B., age 27. Diagnosis: hysteria with amenorrhea. Operation of dilating and curetting the uterus performed on September 10th at 10 a. m. by Dr. Robb. Patient very noisy; morphia in ⅛ grain doses administered at intervals of 3 to 4 hours. After the operation vomiting was constant. Previous to operation the patient had had convulsions; they did not appear subsequent to the operation. Death occurred at 7 a. m., December 11th. Autopsy at 11 a. m., December 11th. Anatomical diagnosis: acute fatty degeneration of heart, kidney and liver. Bronchiectasis and slight broncho-pneumonia and bronchitis. Operation: curetting of uterus.

Body of large, strongly-built and well nourished woman. Subcutaneous fat abundant; muscles pale.

Both of the lungs are adherent to the pleura by old adhesions: neither lung retracts on removal of sternum. The bronchi of both lungs are dilated and contain a considerable quantity of muco-purulent fluid. Around some of the smaller bronchi in the lower lobes small areas of consolidation exist.

The left ventricle of the heart is firmly contracted: the right is dilated and contains soft dark clots and fluid blood. The myocardium of both ventricles, particularly the left, is pale and easily torn. The coronary arteries are normal.

The liver and kidneys, besides being pale and presenting a fatty appearance, are not essentially altered.

The ovaries are cystic, and the left presents a few torn adhesions.

The uterus measures 8 cm. in length; its mucous membrane is roughened, and above the cervix somewhat lacerated.

The microscopical examination of the heart muscle shows it to be black from fat. Acetic acid made no change in its appearance. The fat is in such large amount and so generally distributed that no part of the muscle can be said not to contain it.

Both the liver and kidney are intensely fatty.

Cultures from the organs remained sterile.

Mrs. R., age 28. Had been married two years. No children; no miscarriages. Her last menstrual period lasted from the 3d to 7th of July. About eight weeks before admission (August 21st, 1891) she began to suffer from nausea and vomiting. Nausea has continued almost without cessation.

On admission the face was emaciated, conjunctivæ pale. Pulse 96, full and regular. Examined under ether by Dr. Robb, the diagnosis of pregnancy was made. As the patient seemed to be improved, no operation was performed. She suddenly became much worse and died on September 2nd. The patient's temperature did not rise above 101.8° F. (in the rectum) until day of death, when it reached 102.8°. Autopsy immediately after death.

Body 155 cm. long; fairly nourished; still warm, but rigor mortis already fairly advanced. Subcutaneous fat in moderate amount; muscles pale.

Punctate hemorrhages found in the peritoneal cavity. The abdominal organs, with the exception of the liver and kidneys, which present a distinct and striking fatty appearance, and the stomach which contains several hemorrhagic erosions, apparently are normal.

The lower lobes of the lungs are congested. There are no pneumonic patches to be made out.

The heart contains fluid blood. The valvular apparatus and vessels of the heart are normal. The muscle is pale and flabby.

The uterus measures 11 cm. in length; the cavity 7 cm. It contains a fœtus 2 cm. in length and normal fœtal structures.

Frozen sections of the heart showed a most extensive fatty degeneration of the muscle fibres. The fat was present both in small and large droplets, and no trace of striation could be made out in the muscle fibres. The kidneys and liver were likewise extremely fatty.

Cultures were entirely negative.

A. P., white, age 16. Admitted into service of Dr. Osler, Oct. 1, 1891; died Nov. 1, 1891. Her present illness dates from March 5, at which time she had a chill and is said to have screamed for 12 hours. Later had similar attacks which were controlled by opium.

Her condition on admission showed only considerable emaciation. No organic lesions were detected. Urine was free from albumen. She had various attacks of an epileptiform character. Vomiting set in on 21st of October and continued almost without interruption. Took nourishment well even at this time. She died November 1, at 3 a. m.

Autopsy at 10 a. m. Body extremely emaciated; mammæ alone retain fat. The grade of emaciation is even more marked than is seen in cancer or stricture of the œsophagus.

Peritoneal cavity quite normal. Heart of medium size; the edges of the mitral valve present slight thickening. Lungs congested and show a few early broncho-pneumonic patches. Brain quite normal.

Frozen sections of the heart, liver and kidneys show extensive fatty degeneration.

The cases agree in the absence of other important patho-

logical lesions than the intense fatty changes in the parenchymatous organs. They have all occurred in women, they have been associated with more or less anæmia, and in one case with extreme emaciation.

Our experiments on animals embraced the use of different agents. The common occurrence of fatty degeneration of the myocardium in diphtheria, as has just again been pointed out by Romberg,[*] is borne out by our experiments on animals. From the following table it will be observed that in 19 experiments embracing guinea-pigs, rabbits and kittens, dead of inoculation with the bacillus diphtheriæ or its products, fatty degeneration appeared in 14. Further, the degeneration did not depend on the duration of the infection, but it occurred especially in those cases in which the infection was rapid in its termination. It would, therefore, appear to depend more on the intensity of the poison than on the time of its action.

In the case of the filtrate of the diphtheria bacilli, where a given quantity only of the poison is introduced, this difference is not noted. In four cases of death from this cause, fatty changes were present in two, and these corresponded to the longest periods of life succeeding the inoculation. Whether this difference is merely apparent, or whether it depends on some difference in the action of the soluble virus as compared with the living organisms, more experiments are needed to decide. It is conceivable that during the short period of increase of the bacilli in the body of animals, sufficient poison is produced to bring about the fatty changes in the same short time which is required to destroy the animal. In all cases a much larger dose of the filtrate than of the culture was employed, and we know from Roux and Yersin's[†] experiments that the poison may sojourn in the body for weeks and even months before it causes death. Hence the two conditions, death and fatty degeneration, may go together, although it is not to be assumed that the former depends on the latter. There are other very extensive lesions produced by both agents[‡] which must be taken into account.

The animals which succumbed to inoculations with toxic doses of dog's serum that were not immediately fatal showed without exception fatty degeneration of the heart muscle. It is worth mentioning that in only one instance was the fatty degeneration severe, and that was in the case of an animal which received a quantity of serum far greater than the immediate toxic dose. The serum used in this instance had been heated to 55° C. for 30 minutes, and although it was not without effect both on the respirations of the animal and on the red blood corpuscles, the latter as proven by the occurrence of hæmoglobinuria, yet the animal soon recovered from the depression which followed the injection and lived seven days.

The results obtained from the inoculation of animals with the tox-albumens derived from the higher plants, ricin[§] and abrin, are not without interest. These substances, as shown

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* Zeitschrift f. klin. Medicin, Bd. 48.

† Annales de l'Inst. Pasteur, 1889, n. 6, p. 273.

‡ Welch and Flexner, Johns Hopkins Hospital Bulletin, Nos. 15 and 20.

§ Ricin: the toxic albuminous principle obtained from the castor bean, ricinus communis. Abrin: obtained from the jequirity bean, abrus præcatorius.

by Ehrlich,* possess properties which bring them into close relationship with the bacterial toxines. Under essentially similar conditions of dose calculated on body weight, abrin produced severe fatty changes in two out of three cases in rabbits, whereas ricin in two out of four cases caused in these animals only slight changes.

TABLE II.—RESULTS OF INOCULATION.

Substance inoculated.	Animal.	Length of time survived inoculation.	Total No. of cases.	No. of cases not fatty.	No. of cases fatty.	Degree of fatty degeneration.			
						Very.	Moderately.	Slight.	
Diphtheria bacilli.......	guinea pig.	38 hours.	1	..	1	..	1	..	
" "	kitten.	38 "	1	..	1	..	1	..	
" "	guinea pig.	41 "	2	..	2	1	1	..	
" "	rabbit.	54 "	1	..	1	..	1	..	
" "	guinea pig.	60 "	1	..	1	..	1	..	
" "	guinea pig.	72 "	2	1	1	..	1	..	
" "	kitten.	4½ days.	1	1	..	..	..	..	
" "	guinea pig.	4 "	2	..	2	1	1	..	
" "	guinea pig.	5 "	1	1	..	..	..	..	
" "	kitten.	6½ "	1	..	1	..	..	1	
" "	rabbit.	8½ "	1	..	1	1	.	..	
" "	guinea pig.	20 "	1	..	1	..	1	..	Post-diphtheritic paralysis.
Filtrate from culture of bacillus diphtheriæ..	guinea pig.	48 hours.	1	1	..	..	..	..	
" " "	guinea pig.	54 "	1	1	..	..	..	..	
" " "	guinea pig.	5 days.	1	..	1	..	1	..	
" " "	guinea pig.	26 "	1	..	1	..	..	1	
Serum of dog.............	rabbit.	13 "	1	..	1	..	1	..	
" "	rabbit.	25 "	2	..	2	..	1	1	
" "	rabbit.	7 "	1	..	1	1	..	..	Received serum heated to 55° C.
Sol. of abrin in 10% NaCl sol.................	rabbit.	20 hours.	1	..	1	1	..	..	
" " "	rabbit.	25 "	2	1	1	1	..	..	
Sol. of ricin in 10% NaCl sol.................	rabbit.	18 "	3	2	1	..	..	2	
" " " "	rabbit.	20 "	1	1	..	..	..	..	
" " " "	guinea pig.	48 "	1	..	1	1	..	..	
" " " "	guinea pig.	5 days	1	1	..	..	..	..	

The underlying conditions on which the occurrence of fatty degeneration depends have been the subject of much study. There can, we think, be no doubt that in human beings the condition occurs with such persistency in certain diseases as to indicate a causal connection. Notwithstanding the recent study and criticism of Krehl, it must be admitted that there are disease processes in human beings in which it is often present. The latter author admits but one condition in which it is uniformly present in such amount as to stamp it as related to the pathological process, viz. phosphorus poisoning. He denies its significance in such other affections as chronic heart disease and severe forms of anæmia.

The views of Recklinghausen and Zenker† seem much more to accord with the general experience. In one class of affections, namely, chronic heart disease with hypertrophy and dilatation of the heart, there can be no doubt of the common occurrence of fatty degeneration, even if at the present time it is not possible to associate it more definitely with the lesions and to ascribe to it a rôle in the production of the failing compensation.

The endeavor to make the fatty metamorphosis of the proteid constituents of cells depend on the diminution of oxygen supplied to them has not met with success. Even the attractive hypothesis of A. Fraenkel,‡ based on experiments on dogs in which the excretions had in consequence of starvation fallen to a mean, and which became increased after constriction of the trachea, cannot at this time be maintained. In phosphorus poisoning, in which, according to Bauer's * experiments, the excretion of N is increased with a great increase in the fat found in the tissues, the destruction of red blood corpuscles plays no essential part. Indeed, in those cases in which after the injection of phosphorized oil there was a destruction of red blood corpuscles, this was shown to depend on the acid character of the oil, and not to be due to the phosphorus itself. However, in his experiments the oxygen absorption was diminished in one case as much as 45 per cent., and the carbonic acid excretion 47 per cent. The effect of the latter was not to cause an increase in the fat production out of proteids, although it influenced its elimination.

The experiments of H. Meyer,† on the other hand, show that fatty changes may set in before the blood pressure, as commonly happens, is reduced by phosphorus poisoning, or any alteration in the gaseous constituents of the blood has occurred. And with other deoxidizing substances, such as iron and platinum, which also cause a reduction of the blood pressure, no fatty changes can be detected in the poisoned animals.

The effects of depriving animals of a portion of their blood was shown by Bauer ‡ to result in increased proteid disin-

* Deut. med. Wochenschrf. 1891.
† Verhand. des X Internat. Med. Congress, Band II, Abtheil. iii, S. 67 u. 74.
‡ Charité Annalen, 2. Jahrgang (1875), S. 309.

* Zeitschrift f. Biologie, Bd. 7 u. 14.
† Archiv f. experimentelle Pathologie, Bd. xiv.
‡ Zeitschrift f. Biologie, Bd. 8.

tegration and the accumulation of fat in the tissues. Less fat is, after such blood abstraction, destroyed, whether it is made in the tissues or introduced from without. And, in opposition to the experiments of Perls,[*] in which by repeated abstractions of blood from dogs he succeeded in producing a condition of marasmus associated with slight fatty degeneration of the heart muscle, detectable by the microscope, Meyer[†] found that after depriving rabbits of such a quantity of blood that the oxygen value sank to one-half its normal amount, no change of this kind occurred in the organs.

Bearing on the relation of anæmia to the production of fatty changes, we have the recent research of Kraus and Chovstek,[‡] who measured the oxygen absorbed by human beings in a state of anæmia, and found that even in those cases in which the number of red blood corpuscles was reduced to 1,000,000 per cubic millimetre, and the hæmoglobin to 20 per cent, no diminution occurred. That the essential cause of the extensive fatty changes found in pernicious anæmia is the blood condition is, in view of these results, rendered extremely doubtful.

The influence of elevation of temperature has at different times been urged as a cause of fatty changes in the organs. Liebermeister, who regarded fever as the only common phenomenon in a variety of conditions leading to such changes, regarded the elevation of temperature as the cause. The experiments of Wickam Legg, Litten, Naunyn and Welch shed new light on this question. The first two observers never failed to find fatty changes in the organs of animals kept at an elevated temperature. Wickam Legg claims to have found it as early as twelve hours after the beginning of the exposure, and Litten,[§] who experimented on guinea-pigs, and kept them in a double-walled metallic cage at the temperature of 98.8° F. (37° C.) with dry, or 96.6° F. (36° C.) with moist air, never failed to find fatty degeneration at the end of 36 to 48 hours. Naunyn,[||] who used a larger and better ventilated box, failed to find any parenchymatous or fatty degeneration after he had kept rabbits for two weeks at higher temperatures than Litten employed. Welch, on the other hand, although he used a box larger than Naunyn's, found that in rabbits which had been kept for at least a week with an average rectal temperature of 106° F. (41.1° C.) fatty degeneration in moderate

[*] Quoted by Recklinghausen, Handbuch d. allg. Pathologie, S. 387.

[†] *Arch. cit.*

[‡] Wiener klin. Wochenschr. 1891, No. 33.

[§] Virchow's Archiv, Bd. 70.

[||] Arch. f. exp. Pathologie u. Pharmacologie, Bd. 18.

degree was present. He says : "The higher and less fluctuating the internal temperature, the more certain was the degeneration to appear. I could reckon upon obtaining rabbits with well-marked fatty degeneration of the heart by keeping them for ten days with a rectal temperature between 107° F. (41.7° C.) and 108° F. (42.2° C)."

Welch[*] showed that animals which had been kept in the hot-box for four days previous to inoculation with the bacilli of swine plague and then replaced, succumbed after 36 hours, and, at the autopsy, the most extreme fatty degeneration of the organs was found. Little or no degeneration of the heart is found after the infection with this organism when the animal is kept at the ordinary temperature.

As to the effect of fatty degeneration on the heart muscle it can be said that, according to the experiments of Welch just mentioned, rabbits kept for three weeks in the hot-box and in which there was every reason to believe that fatty degeneration of the heart muscle existed, showed no symptoms of heart paralysis, and after removal from the box remained perfectly normal. The carotid pressure of animals which had been kept in the hot-box from ten days to two weeks showed no diminution.

From our table of cases derived from human beings, as well as from the experiments on animals, it will be seen that in certain infectious processes fatty degeneration of the heart muscle is more likely to occur than in others. It is a fact not without significance that two diseases in which weakness of the heart's action is commonly observed, e. g. typhoid fever and pneumonia, are remarkable for the entire absence of fat or its presence in slight amount, rather than the opposite.

When we consider that in that form of intoxication in which the fatty changes are most exquisitely found, namely, in phosphorus poisoning, the direct injurious influence on the oxidative processes of the body can be excluded. That, further, in the anæmias which occur in human beings and can be produced experimentally upon animals, fatty changes are often absent or occur in only inconsiderable degree; and finally, that the effect of fever alone is all but established to have a relatively slight importance in bringing about such changes as act injuriously upon the heart's function, therefore it seems unavoidable to connect with the occurrence of fatty degeneration in its severer forms in the infectious diseases of man and animals a disturbance of cell metabolism more nearly like that which phosphorus intoxication induces. The researches of Voit, Bauer and others have shown that the fat is produced out of the proteid constituents of the cells.

[*] The Cartwright Lectures, Medical News, Phila., 1888.

PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS HOSPITAL MEDICAL SOCIETY.

Meeting of December 18th.

A Case of Healed Aneurism of the Aorta.— DR. BARKER.

The case which I wish to present to-night is of considerable interest on account of its rarity. I have to thank Dr. Osler for permission to make a few remarks to the Society concerning its history.

The individual, a colored man, claims to be forty-three years of age, but is almost certainly over fifty. He complained when first seen in the dispensary on December 31, 1891, of cough, shortness of breath, and slight swelling of the legs. No satisfactory anamnesis could be obtained, owing to the low grade of intelligence of the patient. Three important points could be made out, however, in the previous history: first, hard work; second, a probable syphilitic infection; and third, excessive alcoholic indulgence. He had been accustomed to carry heavy weights all his life, and during the civil war in the sixties had a "rough time of it," sometimes suffering severe privation. He denied having had any venereal disease, but the evidence is on the whole in favor of a syphilitic infection some twenty years ago. From his family history we learn that his wife has had two abortions, for which no cause could be assigned. Among the previous diseases from which he had suffered there was none which appeared to have any bearing upon his condition on admission.

In the absence of any direct history with regard to a tumor in the thorax, we were astonished to find there, on physical examination, what appeared to be a very serious condition, and the following note on the case was dictated: "Man of fairly large frame, musculature firm and well developed, numerous old scars on legs; lips and mucous membranes rather pale; tongue large, flabby, slightly coated, and indented at the edges by the teeth. Patient sits up in chair, but is short of breath, and answers questions with difficulty. There is no marked difference in the pulse at the two wrists. The walls of the radials are considerably thickened, and the vessels feel like whip-cords when rolled beneath the fingers. The brachial and femoral arteries pulsate visibly.

Thorax large, epigastric angle wide; in the upper part of the thorax in the parasternal region on the right side is a globular swelling, extending from above the right sterno-clavicular articulation above to the third rib below. This pulsates visibly with each beat of the heart. On palpation there is a heaving systolic impulse, and also a very evident diastolic shock over the projecting area. There is dulness on percussion over this area, the flatness being most marked at the right border of the sternum. Tracheal tugging can be obtained readily and is a well-marked sign. There is decided accentuation of the aortic second sound over the area occupied by the tumor, but no distinct bruit can be made out. The apex-beat of the heart is visible and palpable in the fifth space in the left anterior axillary line. The heart dulness goes over into the aneurismal dulness. The first sound at the apex has a rumbling character, but there is no distinct murmur, either systolic or diastolic. The lungs are negative. The liver dulness cannot easily be outlined; the spleen is not palpable. There is slight movable dulness in the flanks. No glandular enlargement made out."

The presence of this pulsating swelling on the right side of the sternum, the diastolic shock over the swollen area, the marked tracheal tugging, the signs of general arterial disease, the absence of any evidence of aortic insufficiency, or of solid intrathoracic tumor, made the case seem clear. We arrived, we thought very easily, at the diagnosis of arteriosclerosis with aneurism of the arch of the aorta, and of that part of the arch in which an aneurism gives rise to physical signs rather than to clinical symptoms, viz. the ascending portion.

The patient was advised to enter the hospital for treatment, but he declined to do so at that time. A rather unfavorable prognosis was given, and he was told to go home, to rest in bed, and restrict his diet, large doses of iodide of potassium being ordered at the same time.

Nothing more was seen of the patient until April 24th, 1893, when he again applied to the dispensary for treatment, and was seen by Dr. Ramsay, who made a note to the effect that there was a decided diminution in the pulsation.

On the seventh of October of this year he entered Dr. Osler's wards, but left after a few days. He re-entered the ward in December and has been brought down here to-night. As you see him, his condition is very different from that described in the note made two years ago. There is still swelling and distinct bulging in the upper sternal region on the right side, especially at the right sterno-clavicular articulation. Over this area there is marked dulness, and on deep palpation in the episternal notch a firm resistant mass is met with. There is now scarcely any pulsation, and tracheal tugging is very indistinct, if it can be said to exist at all. The signs of arteriosclerosis are perhaps even more marked than when previously seen. The apex of the heart is still displaced to the left, and now a definite systolic murmur can be heard at the apex. There is no diastolic murmur, nor is either of the sounds at present particularly accentuated over the dull area. On admission the patient had a little œdema of the legs, and was passing urine containing a trace of albumen, a few granular and hyaline casts with occasional red and white blood corpuscles. It was difficult to understand the meaning of the physical signs in the upper part of the thorax, until the earlier record made in the dispensary was referred to. The only available explanation seems to lie in the assumption that the aneurismal sac has been slowly filled with clots, which later perhaps have been replaced in whole or in part by fibrous tissue. Naturally, one hesitates before making such a conclusion concerning the condition *intra vitam*, and the further progress of the case will be watched with interest. If it should turn out that the case before us is really one of healed aneurism of the aorta we shall have to modify somewhat our ideas as to the hopelessness of the disease.

Two Cases of Excision of the Knee-joint in which Hansmann's Plates with ordinary Screws were employed.— DR. HALSTED.

CASE 1. Woman, 47 years old. Two months ago she had a miscarriage which was followed by pyæmia. Both knee-joints became infected. The right one recovered prior to her admission to the hospital. On admission, six weeks ago, the left knee-joint was distended with a puro-synovial fluid. This fluid was withdrawn soon after admission through an aspirating needle, and the joint subjected to a prolonged washing with a solution of hydrarg. bichlor. (1-1000). The pain, which had been great, subsided after the aspiration and washing, and the temperature, which had been 99° to 101°, became lower for about one week. Then the symptoms of pus in the joint reappeared and the aspiration and washing were repeated in two weeks, this time with perhaps less success than at first. The patient absolutely refused further operative treatment for three weeks. In the meantime the inflammation of the joint made rapid strides. The joint was distended to its utmost capacity with pus. The tissues about the joint were infiltrated and the skin was red and tense. Ultimately, and when the patient's general condition had become so bad that her life was almost despaired of, she consented to an operation.

A transverse incision was made through the skin and also then two longitudinal incisions, making with the first the letter H. The internal longitudinal incision opened a dissecting extra-capsular abscess. The joint was, as I have said, filled with pus. The cartilages were still intact. The crural ligaments were softened,

but had not yet parted. A horizontal slice about 1.5 cm. was taken from the tibia, and a somewhat thicker slice from the femur. Such portions of the femur cartilages as were not removed with this slice were shaved off subsequently. I make it a principle never to leave exposed cartilage in a wound. The walls of a dead space should never be of tissues which cannot furnish granulations readily. The bones were held together by Hansmann's plates and my screws.

The knee is already almost perfectly firm,* although it is only three weeks since the operation. The wound has healed absolutely *per primam*, notwithstanding the fact that the operation was performed through actively suppurating tissues, and notwithstanding possibly the still more important fact that the patient's vitality was at a critically low ebb at the time of the operation. I have repeatedly called your attention to the objections to Hansmann's screws which, beyond the flange, have a shank long enough to project through the skin wound. They must be ultimately removed, and they necessarily lead to suppuration. My screws are so short that when screwed home they are almost flush with the plate. They are designed to remain in the wound. It has occurred to me that possibly staples over stiff wire might well replace the plate and screw method. The staples could be very fine and might be clinched on the other side of the bone if necessary.

CASE 2. Woman, 24 years old. This patient had a tuberculous knee-joint which was treated for many months with iodoform-glycerine injections, without much success. Excision was finally decided upon and performed four weeks ago. A modified Helferich's method of excising was employed. The bones are cut in such a way that the convex lower end of the femur fits more or less accurately into the concave upper end of the tibia. We usually make use of this method, or a modification of it, in excising tuberculous knee-joints. The semicircular cut into the head of the tibia sometimes reveals and partially or wholly removes tuberculous foci which might be overlooked if the bone were simply trimmed in the usual way. By this method, or rather a modification of it, the cartilage of the femur is thoroughly removed and the condyles are so trimmed that any tuberculous invasion of them is almost sure to be exposed. In short, we make a virtue of necessity, for in trimming the bones to the desired shape we may eradicate the disease.

When the knee-joint has been excised in this way, and it has not been necessary to remove too much bone, the femur locks into the tibia so firmly when the leg is extended that there is little tendency to displacement. When the plates and screws are used the bones are held still more firmly in position.

Helferich's method of excising the knee-joint was devised for joints which are anchylosed in a flexed position. He believes that with the semicircular incision he gets less shortening of the limb than when he cuts out the usual wedge-shaped piece of bone. We are very much pleased with the screw and plate method. The results have been surprisingly gratifying. In the four or five previous cases in which we have used them the anchylosis has been absolute. In no case has there been suppuration, and in no case have the plates and screws caused the patient uneasiness.

CASE 3. APPENDICITIS.—Male, æt. 30. I exhibit this case not for any particularly interesting feature of its own, but because I wish to call your attention to a diagnostic sign of appendicitis which I believe to be of considerable importance. My experience would teach me that this particular sign is probably present in all cases, and in all stages, except one, of the disease.† It is this: one cannot press with the fingers into the false pelvis on the affected side so deeply as on the healthy side. In the earliest stages it is a spasm of the muscles which prevents one from dipping into the iliac

* _Footnote text illegible._ The knee became absolutely firm within five weeks of the operation. Knee became perfectly well and entirely free of pain.
  Footnote text illegible. ...peritoneal, and the abdomen is excessively ...may be masked.

fossa. Later it is the adhesions between the cæcum and abdominal paries, and occasionally between the omentum and abdominal paries. And, finally, it is the exudate itself. At times two, and at times all three of these obstructing factors may be present. It is the exception that one of them is found alone. It is only to the first, and afterward to the second of these factors that I particularly wish to call your attention. The muscle-spasm may be so great and its edges so sharply defined that inspection reveals a fullness, and palpation detects what seems to be an induration. This muscle-spasm may be partially or wholly eliminated by the proper application of the Paquelin cautery. When the patient is fully anæsthetized no trace of the spasm remains. We have seen some cases so early that nothing but the spasm of the muscle has prevented us from dipping normally into the iliac fossa. More frequently, however, in addition to the muscle-spasm there have been adhesions between the cæcum and the parietal peritoneum. It is possible to foretell the presence of these adhesions, in the absence of any considerable exudate (of anything more than a few drops of pus) by palpation of the brim of the pelvis and of the iliac fossa. In this patient the adhesions between the parietal omentum and parietal peritoneum prevented us from dipping normally into the pelvis on the right side. After separating these adhesions we at once encountered the erect central half of the appendix in cross section. The appendix had been bent upon itself at a right angle or less, and had ulcerated through at about its middle. The peripheral piece was adherent to the abdominal wall. There was a little pus, three or four drops at most, encapsulated between the abdominal paries and the peripheral end of the central piece and the central end of the peripheral piece of the appendix. A point of great importance in the operative treatment of these cases, and one to which we give perhaps an unusual amount of attention, is the packing off of the uninfected portion of the abdominal cavity from the infected portion prior to opening the abscess, however small this abscess may be. And even when we believe that there is no abscess we pack off the general cavity with just as much care prior to the separation of the adhesions which glue the cæcum to the parietal peritoneum ; and, in the absence of such adhesions, prior to separating the adhesions which bind down the appendix. Should pus be present it is carefully caught and disposed of in such a way that there is perhaps the least possible danger of infecting the general peritoneal cavity. I fear that I cannot well describe to you our method of packing off and protecting the general peritoneal cavity. We use a good many sponges of gauze superimposed upon each other in such a way that should the innermost ones become soiled the outermost remain clean. It is well, if possible, to so pack the outermost strips of gauze that they may remain undisturbed and form a part of the final packing of the wound. For adhesions form with surprising rapidity (in a few minutes) which it is undesirable to disturb. We have operated upon thirty-four cases of appendicitis, and without a death if we except the nine perfectly hopeless cases which had acute suppurative peritonitis before they were operated upon. Five cases of appendicitis with a less desperate form of peritonitis were saved by operation.

Of four cases of appendicitis without peritonitis operated upon by me outside of the hospital, all recovered from the disease; and of two with general suppurative peritonitis, both recovered from the peritonitis, but one of them died from hemorrhage about two weeks after the operation and when he was believed to be surely convalescent.

Report of Cases.—DR. BLOODGOOD.

CASE 1. STRANGULATED HERNIA.—This old man had a double hernia for a great number of years, and a week before he came in, the right one became irreducible and he had symptoms of strangulation. We operated on him and found the very interesting condition that the bowel was strangulated within the sac, and only one knuckle of the bowel was constricted. It was quite blue, but on relieving

the constriction the circulation returned and we put it back. He was such an old man (65 years) that we thought there was more certainty of a cure if we took out the testicle. He had the very interesting condition, after the operation, great distension of the intestines, confined chiefly to the zone above the umbilicus; there was no tenderness. He has made an uncomplicated recovery, and you see the wound has healed typically.

CASE 2. RUPTURE OF RIGHT ABDOMINAL MUSCLE.—This case has been in about five weeks. He was caught between two freight cars about eight o'clock in the morning and was brought here a short time afterwards in severe shock; so great that in the morning we thought he was going to die and we put him to bed. He had a tumor occupying the right umbilical region, and we could feel that the rectus was ruptured, and thought this tumor was the intestine protruding through. In the evening he was a little better, and we decided to operate because we thought there was some injury to the intestine. We made an incision and found the intestines were directly below the skin, and the rectus and other abdominal muscles were ruptured and contracted, and hemorrhage had occurred into them. We had to hurry very much, as his pulse was bad. We reduced the intestines after suturing the peritoneal coat (which had been torn and the muscular coat exposed over a small area of the caecum and ileum). We found no hemorrhage into the abdominal cavity, but we found an extravasation of blood under the entire parietal peritoneum and in the mesentery. Everywhere the peritoneum looked black. We sutured the muscles loosely, packed the wound with iodoform gauze, as on account of retraction we could not cover the intestines entirely. We did not close the skin, fearing sloughing of the injured muscles. The packing was taken out gradually and also the sutures in the muscles. Healing proceeded rapidly by granulation, and only a small portion of the lower end of the rectus sloughed. The wound you see is almost healed. There has been no fever and no complication.

NOTE.—The patient has returned to work with an abdominal corset, the portion over the area of rupture being laid with zinc plate. He seems as strong as before his injury.

DR. FINNEY.—There is one feature in the last case which Dr. Bloodgood has not mentioned—the condition of the man's eyes. When he was brought in the eyes were very much ecchymosed and very prominent, and there was considerable hemorrhage behind the conjunctivæ. The men who saw the accident say his head was not struck by anything. Of course there must have been a great deal of pressure exerted from the abdomen. In what way that caused the conjunctival hemorrhage I am not prepared to say, but certainly it came on at once, as the men who pulled him out of the car say it was present then.

DR. HALSTED.—The same thing was observed at the Chambers-street Hospital at the time of the crush of the Brooklyn Bridge. At that time a great many people were killed, and when brought to the hospital this protrusion of the eyes was a very striking feature in some of the cases, particularly in the women and the shortest men. The tremendous pressure below caused the congestion in the parts above. The bodies were unnaturally white, whereas the heads and necks were dark purple and in some cases almost black.

DR. BLOODGOOD.—We have now in the hospital a second case demonstrating this condition. The man was crushed by an elevator, both clavicles, left scapular and most of the ribs of the left side were fractured and this side flattened. Head not injured. In both cases the condition has disappeared.

Meeting of January 15, 1894.

Myomectomy during Pregnancy, involving Opening of the Abdominal Cavity.*—DR. STAVELY.

We have learned by a gradual process of deduction from cases reported in medical literature, that operations performed upon the

* Abstract of paper to appear in the Johns Hopkins Hospital Reports.

pregnant uterus, or upon the uterine adnexa during pregnancy, are not attended by any extreme danger. Myoma complicating pregnancy is rather uncommon on account of the tendency of this growth to cause sterility, or in the event of pregnancy, early abortion. Virchow and Scanzoni state that fully 50 per cent of women bearing myomata are sterile.

If pregnancy occurs notwithstanding the existence of this growth, the necessity for surgical interference must be considered, and depends upon the individual peculiarities of each case. Thus a small myoma may not complicate the course of pregnancy or interfere with labor, no matter where situated. An interstitial myoma of the upper zone of the uterus, even though of considerable size, usually offers no mechanical obstruction to labor, and unless symptoms arise which render an operation necessary, should not be touched.

Tumors which are situated in the early months of pregnancy in the lower part of the uterus, may gradually ascend from the pelvis, and occupy such a position at term that labor is in no way complicated by their presence.

A pediculated myoma, blocking the pelvis and causing severe pressure symptoms, may frequently be freed from its confined position by careful manipulation. This is sometimes accomplished more readily by placing the patient in the knee-chest position. Manipulation may fail either on account of the cramped environment of the tumor, or on account of adhesions which bind it so firmly in the pelvis that attempts at separation may be attended by disastrous consequences.

Two cases cited by Phillips aptly illustrate some of the dangers of too forcible or too persistent efforts to displace these tumors. In the first case, operated upon by Knowsley Thornton, for incarcerated pediculated myoma, furious bleeding which threatened the patient's life followed the forcible displacement of the tumor after the abdominal incision had been made.

In the second case, operated upon by Hanfield-Jones, a myoma the size of a fœtal head was impacted and adherent in the pelvis. Before the operation (a Porro-Cæsarean), persistent efforts were made to liberate the growth, but without success. The patient died of peritonitis, and at the autopsy the tumor was found to be much "bruised," and Phillips, who saw the case, believes that the rough manipulation might have had some bearing on the fatal termination.

The dangers from surgical operation in these cases are shock, abortion, hemorrhage, intestinal obstruction and infection. Shock depends in a great measure upon the dexterity of the operator and the duration of operation. Abortion depends upon the amount of the manipulation, upon the extent of the involvement of the uterine tissue, and upon the absence or presence of a tendency to abortion. If the uterine cavity is opened, abortion almost inevitably occurs. Hemorrhage is to be feared on account of the greater vascularity of the uterus during pregnancy. This applies only to the sessile myomata, and a number of operations performed for the removal of these growths show that even this fear is somewhat exaggerated. Abortion and hemorrhage after operation, in the majority of instances, may be averted by absolute rest in bed and the judicious administration of morphia. Infection is to be avoided by carrying out a thoroughly aseptic technique.

The dangers from non-interference in these cases are abortion, hemorrhage, sepsis, rupture of uterus, pressure symptoms, intestinal obstruction and mechanical obstruction to labor.

The free hemorrhage induced by interstitial myoma frequently tends to detach the ovum. Gusserow, however, thinks it is not yet proved that abortion is more frequent when myomata exist.

Several writers state that when pregnancy goes to term, hemorrhage is almost certain to occur in those cases in which an interstitial myoma is situated opposite the placental attachment, and that when abortion occurs upper wall hemorrhage is always profuse and sometimes fatal. Although it is contended by some writers that placenta previa is more often met with in these cases.

the research of Nauss seems to disprove this statement, as he only found this anomaly twice in 241 cases.

Myomata, as a rule, grow very rapidly during pregnancy, after which they undergo a degenerative process, offering a good opportunity for infection. Peritonitis and rupture of the uterus may follow this retrogressive change in these tumors. Pressure symptoms and pain, which is often quite severe, are often present.

Statistics collected for the purpose of ascertaining the results of non-interference in these cases are interesting. Lefour reports 307 cases with 39 abortions and 14 maternal deaths ; Nauss, 241 cases with 47 abortions ; Süsserott, 147 cases with 8 maternal deaths after the application of forceps, 12 after version, and 13 after artificial removal of placenta. Jetter records 215 deliveries in 165 cases with 64 maternal deaths. Gusserow reports 228 cases, of these 123 died. Suturgin states that scarcely one-fifth of the cases complicated with myomata terminate without surgical measures, and that about one-third of the mothers and one-half of the children die during or soon after labor.

Two cases of pregnancy, complicated with myoma, were operated upon by Dr. Kelly in the Johns Hopkins Hospital in 1892. The following brief synopsis of their histories is given :

Case I. Mrs. S., æt. 25, admitted March 7th, 1892. Married eleven months ; menstruated first at eleven years, never regular, last period December 17th, 1891 ; complained of occasional sharp pain in the ovarian and sacral regions, severe headache and nausea.

Examination under anæsthesia.—Diagnosis : Pregnancy complicated by myoma uteri. Operation, March 9th. Simple, uncomplicated myomectomy. Myoma about the size of an orange situated on the posterior and right side of the fundus. Patient made an uninterrupted recovery and was delivered at term of, a living, healthy child.

Case II. Mrs. W., æt. 35, admitted July 23d, 1892. Multipara, menstruated first at thirteen years of age, flow regular. Married twice, first time fourteen years ago, second time four months before admission to hospital. Last menstrual period three weeks after second marriage. Tumor noticed in right ovarian region by patient, thought to be growing rapidly. For last week severe cramp-like pains in the abdomen, radiating into back and down right leg.

Examination.—Myoma about 8 cm. in diameter, growing from the right cornu uteri. The uterus was enlarged and extended 15 cm. to right of median line.

Diagnosis.—Pregnancy complicated by myoma. Operation, July 27th, 1892. Incision along outer border of right rectus muscle revealed a myoma at the right cornu uteri. Myomectomy, free bleeding until sutures were introduced and tied. Recovery uninterrupted, delivered at term of a living child.

In reviewing the literature of this subject 31 additional cases have been found. Pozzi reports 17, Landau 17, and Routier 15 cases, each writer having duplicated the cases of the others, with a few exceptions.

The indications for myomectomy are not always clear. An incarcerated myoma, or one which is causing serious pressure symptoms, or a myoma which constantly threatens abortion in cases where, for reasons of inheritance, it is desirable that pregnancy should continue, or where the life of the patient is endangered by constant and profuse hemorrhage, call for operation.

When only the safety of the mother is concerned, one of the following operative procedures may be adopted : induction of abortion or premature labor, craniotomy, symphysiotomy, myomectomy, the Cæsarean, the Porro, or the Porro-Cæsarean operation. Craniotomy, except in cases of fœtal death, is practically an operation of the past. Symphysiotomy is indicated in properly selected cases, while the graver operations, the Porro and Cæsarean sections, are occasionally called for when myomectomy would be of no avail. In five years, from 1885 to 1890, 157 Porro operations were reported with 48 (30 per cent) maternal deaths and a fœtal mortality of 28 (17) per cent.

During the year 1887, 53 Cæsarean sections were performed with a maternal mortality of 20.8 per cent, and in 1888, 79 operations with a mortality of 24 per cent. The infant mortality in the 132 cases was 5.3 per cent.

An analysis of the table comprising 33 cases of myomectomy performed during pregnancy which I have collected from the medical literature and present this evening shows the following results : Maternal mortality 24.25 per cent, or 8 deaths in 33 cases. Of these, two were due to hemorrhage, one to "long standing aortic disease," and one to peritonitis. Three died after the occurrence of abortion, probably from infection, and in one case the cause was not specified. Twenty-four, nearly 80 per cent, of these cases have been reported since 1884. Eliminating the cases operated upon prior to 1885, the maternal mortality is 16.66 per cent.

Since 1889, 17 cases have been reported, the death rate being 11.75 per cent.

The excellent results obtained in the latter cases are unquestionably due to improved surgical technique.

In the 33 cases, 9 abortions and 1 miscarriage occurred, giving a fœtal mortality of 30.3 per cent. Twenty women were delivered at term of living children. In three cases in which the mother died, no statement is made concerning the occurrence of abortion.

According to the variety of tumor, whether pediculated or sessile, death occurred as follows : in 16 cases tumor pediculated, 4 deaths, including the patient with "aortic" disease ; one case aborted and one gave birth to a still-born child, after which she died. In fifteen cases of sessile myoma, six abortions occurred, and four of these patients died.

As a result of the above analysis the following conclusions have been drawn : (1) operations performed during the last eight years have been attended with much better results than in former years ; (2) operations upon sessile myomata are more disastrous to the fœtus than are those upon pediculated tumors ; and (3) *myomectomy,* in properly selected cases, for pediculated or sessile myoma is comparatively safe and thoroughly justifiable in properly selected cases.

DR. KELLY.—Dr. Stavely's paper is a valuable one, as the tables which he has presented represent a great deal of original research and include a large number of cases which have not been noted in other tabulations. Former statistics have dealt with numbers which were too small to be satisfactory. The association of myomata with pregnancy is a very interesting and important condition, and it is a matter concerning which we want such definite percentages as are furnished by this paper.

Both of the cases operated upon by me went to term and were delivered naturally without any special difficulties. In the first case cited I would not operate to-day as I did then, because I would not feel justified in opening the abdomen to take out a myoma as large as an orange in the fundus of the uterus. I would, however, remove a myoma in the lower part of the uterus of less size than an orange. We have now in Ward H a woman eight months pregnant, having a sessile myoma deep down in the pelvis, attached to the cervical portion of the uterus. To remove such a myoma would be very difficult, and the better way is to let the case go to term and do a Cæsarean section.

Nature seems to protect the myomatous woman from pregnancy, as they are usually sterile, and if they become pregnant, often miscarry. Barriers are thrown about such persons in several ways. The presence of a myoma which invades the uterine cavity not only causes discharges which dislodge the ovum, but may from its position act as a barrier to conception. A large percentage of these cases have inflammatory troubles which bind down and encapsulate the ovaries, making them practically extraperitoneal, and the woman is rendered sterile in that way. Where pregnancy occurs in myomatous cases it is better as a rule to let it go to term, but where the myoma will prove a serious obstacle to delivery it is better to operate, provided the case is seen in the earlier months of the pregnancy.

Lantern Slides as an aid to Clinical Teaching.—DR. KELLY.

I wish to show the value of lantern pictures for class teaching and have selected a few typical slides for reproduction on the screen.

In many ways this method of demonstration is superior to any other, as the object on the screen is so much magnified that the successive steps of an operation or minute points of interest in a specimen can be successfully placed before a large audience.

In plastic and abdominal operations but comparatively few spectators can get sufficiently close to follow the minor details upon which the success of the operation so often depends, but by this method all have an equal view, and special points in technique which it would be impossible to demonstrate in any other way can be made clear.

Lantern pictures are also of the greatest value in showing the variations in contour of the abdomen in myoma, ascites, ovarian cyst, etc., as successive slides which bring out the differential points in diagnosis can be thrown upon the screen, and the student can obtain a much more definite idea of this subject than would be possible from a didactic lecture or demonstration upon a patient. After the significant points are thus brought out he is prepared to appreciate the practical demonstration.

I am greatly indebted to my friend, Mr. Murray, who has taken much interest in this subject and has prepared the slides which are shown this evening.

The speaker then demonstrated by lantern slides the following :

Papillary cyst, specimen of pyosalpinx, extra-uterine pregnancy, elephantiasis of the labia, contour views of the abdomen distended by myoma uteri, ascites and ovarian cyst, cystoscopic instruments, postures in cystoscopic examination, catheterization of ureters by the direct method, clitoridectomy for carcinoma, showing steps of operation from beginning to completion (5 slides), vaginal hysterectomy (15 slides), various forms of prolapsus uteri, and steps in the operation for its radical cure (11 slides), ovarian cyst delivered from abdominal incision, showing method of ligating pedicle, position of surgeon and assistants around operating table during abdominal operation.

NOTICE.

All inquiries concerning the admission of free, part pay, or private patients to the Johns Hopkins Hospital should be addressed to Dr. Henry M. Hurd, the Superintendent, at the Hospital.

Letters of inquiry can be sent, which will receive prompt answer, or personal interviews may be held.

Under the directions of the founder of the Hospital the free beds are reserved for the sick poor of Baltimore and its suburbs and for accident cases from Baltimore and the State of Maryland. To other indigent patients a uniform rate of $5.00 per week has been established. The Superintendent has authority to modify these terms to meet the necessity of urgent cases.

The Hospital is designed for cases of acute disease. Cases of chronic disease are not admitted except temporarily. Private patients can be received irrespective of residence. The rates in the private wards are governed by the locality of rooms and range from $15.00 to $35.00 per week. The extras are laundry expenses, massage, the services of an exclusive nurse, the services of a throat, eye, ear and skin or nervous specialist, and surgical fees. Wherever room exists in the private wards and the condition of the patient does not forbid it, companions can be accommodated at the rate of $15.00 per week.

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BULLETIN

OF

THE JOHNS HOPKINS HOSPITAL.

CONTENTS.

ON THE APPEARANCE OF CARBAMIC ACID IN THE URINE AFTER THE CONTINUED ADMINISTRATION OF LIME WATER, AND THE FATE OF CARBAMIC ACID IN THE BODY.

By John J. Abel, M. D., *Professor of Pharmacology, the Johns Hopkins University.*

[*Read before the Johns Hopkins Hospital Medical Society.*]

It has long been known that an excess of lime water added to the food will render the urine alkaline, but so far as I can ascertain no inquiry has ever been made into the nature of this alkalinity nor into the chemical conditions accompanying it. My attention was first directed to this question by an incident that occurred in the practice of Prof. V. C. Vaughan of the University of Michigan. A mother for whose infant lime water had been prescribed and who had administered it very freely for some months, consulted Prof. Vaughan because of the ammoniacal odor of the child's linen when once it had been moistened with urine. On examination the urine was found to be strongly alkaline and to yield free ammonia. No inflammation of the bladder or other abnormal condition could be detected as a cause for the ammoniacal urine. That a perfectly fresh urine voided from a healthy bladder should give off free ammonia is certainly a fact that calls for examination. Assisted by Dr. Archibald Muirhead, I accordingly performed a series of experiments the results of which I am inclined to believe will be of interest to you. We began our experimental inquiry with a study of the urine of healthy dogs about a year old fed on bone-free meat and fat and found, as was to be expected, that with such a diet the urine is generally acid in reaction, though sometimes amphoteric or faintly alkaline

immediately after meals. Such neutral or alkaline urines, strange to say, often yield very small quantities of free ammonia, especially, so it appeared to us, when the dogs were fed on the ordinary refuse of the butchers' shops—that is, with meat containing much bone.

Having convinced ourselves that only very small quantities of free ammonia when any are given off by the normal urine of the dog, we proceeded to examine the effect of feeding large doses of calcium hydrate. This cream of lime was mixed in equal parts with bran or crumbed bread, the mixture enclosed in large gelatine capsules and then placed far back on the tongue of the dog who was thus forced to swallow the bolus. By feeding twice a day we are able to administer daily to a large dog a to be terms a dose of lime and thus without causing any symptoms of disturbed digestion or any other untoward effects beyond more or less constipation, if only care be taken to administer the lime immediately after meals. When the dogs have been taking such large quantities of lime for five or six days, the freshly-voided urine exhibits the characteristics of the specimens that I have recently to show you.

You will observe that the urine is strongly alkaline, a strip of red litmus paper dipped into it at once turns a deep blue

and a moistened strip of red litmus suspended from a cork in the mouth of the flask also turns blue in the course of a few minutes. You will also observe that the urine is very turbid, that a film of crystals forms on the surface and that a heavy deposit of crystals lies on the bottom of the flasks. This increased turbidity, the surface film and the heavy sediment are almost entirely due to the deposition of crystals of ammonio-magnesium phosphate in all stages of growth. I am well aware that triple phosphates are often to be found in the urine of cats and dogs fed on meat, but they are never deposited so constantly and in such quantities as in the urines under discussion. It must be noted, too, that the triple phosphates are to a large extent precipitated in the bladder itself in the case of dogs fed on lime, for the urine is very turbid at the time that it is voided. A microscopic examination of the surface film often demonstrates the presence of biscuit-shaped crystals, soluble in acetic or hydrochloric acid, with the evolution of much gas. These biscuit-shaped crystals, therefore, are composed of calcium carbonate and they are only to be found when very much lime has been taken and relatively little water has been drunk.

In order to estimate the quantity of ammonia emitted spontaneously by the urine of healthy dogs both before and after feeding lime we proceeded as follows. Twenty-five cubic centimeters of the freshly voided urine were placed in a bowl under a dish containing ten cubic centimeters of normal sulphuric acid and both covered with a small bell jar as in the Schlösing method for determining ammonia. A strip of moistened red litmus paper was hung from the upper part of the bell jar to indicate the time when the absorption of the NH_3 should be complete. Since this absorption requires from five to seven days, a drug that will prevent fermentation must be added to the urine. We employed thymol for this purpose, first breaking it up into small pieces, adding liberally of these and stirring them into the urine before covering it with the bell jar. Check experiments with normal urines were always made in order to exclude the possibility of ammoniacal fermentation. In all cases the urines remained perfectly clear with the exception of the surface layer of thymol and the heavy deposit of triple phosphates. When the strip of red litmus in the upper part of the bell jar that serves as indicator again changes from deep blue to pink, the absorption of ammonia is so far complete that the residual titration of the normal sulphuric acid used for absorbing the ammonia may be undertaken. In a series of such absorption experiments it was found that the following amounts of ammonia had been given off by specimens of lime urine.

Dog No. 1, 20 cc. of morning urine yielded 0.0033 NH_3 in 5 days.

Dog No. 1,	15 "	"	"	"	0.0074 " " 9 "
Dog No. 2, 25 "	"	"	"	0.0054 " " 7 "
"	15 "	"	"	"	0.0031 " " 7 "
"	25 "	"	"	"	0.0044 " " 7 "
" "	25 "	"	"	"	0.0070 " " 7 "
" "	25 " of evening	"	"	0.0072 " " 7 "

Without lime the urine yields, as I said before, only little or no ammonia. Thus the highest amount ever obtained from the normal urine (25 cc.) of dog No. 1, under the conditions of absorption just stated, was 0.0016 gram. The normal

urine of dog No. 2 gave off no ammonia to the standard acid solution during the time that he was under observation. The urine of a third dog which was also more often devoid of free ammonia than otherwise however once yielded 0.00195 gram of ammonia.

These absorption experiments therefore demonstrate that there is regularly a large spontaneous emission of NH_3 from the lime urines, that is, large in comparison with the total amount of ammonia contained in normal urine. A glance at the tabulated results that will be given later, in which the total ammonia in 20 cc. of urine as well as in the 24 hours urine is set down, will make this point very evident.

As the ammonia of urine is ordinarily present in the form of salts, it was of interest to determine what proportion of the ammonia of lime urines was present as free ammonia, and what proportion in the usual form of ammonia salts. In order to solve this question we placed 40 cc. of urine that had stood nine days under the bell jar and had yielded 0.0074 gram NH_3 in that time, into an ordinary exsiccator for another ten days, occasionally adding water to make good the absorption. At the expiration of this time the urine was filtered free of the thymol and sediment of phosphates and treated for ammonia by the Schmiedeberg process. Not a trace of ammonia could be discovered,—hence this particular specimen of urine contained no ammonia in the ordinary form of stable salts of ammonia, all of the ammonia being present as free ammonia. Later experiments have, however, convinced me that this is not always the case, and an investigation is now being carried on in my laboratory on the excretion of ammonia under various clinical conditions in which this question will again be discussed. Leaving aside, then, the question as to the relative amount of ammonia present in the form of free ammonia and stable salts as for the present still *sub judice*, we come to a second question of pharmacological interest, and I should like to digress far enough to treat it here. Does more or less ammonia leave the body in 24 hours after feeding with lime than before, other conditions such as food and drink remaining constant? The experiments of Coranda,[*] Munk and Salkowski[†] have taught us that salts of the fixed alkalis, sodium carbonate for example, lower the amount of ammonia excreted in the twenty-four hours urine. Now sodium carbonate, while it causes the urine to become alkaline in reaction, does not, as I have demonstrated, cause the appearance of free ammonia. This marked difference in the influence of the two drugs on the character of the alkalinity of the urine caused us to test the influence of lime on the total ammonia excretion. Ammonia determinations were made twice a day by the Schmiedeberg[‡] method for a number of consecutive days before and after feeding with lime. Briefly stated, this method, which is to be preferred to the Schlösing method for dog's urine, involves the following manipulations. Twenty cc. of the urine are precipitated with platinum

*Archiv f. experimentelle Pathol. u. Pharmakol., Bd. 12, pp. 76-96.
† Archiv f. pathol. Anat. 1877, Bd. LXXI. Maly's Jahresber. der Thier. Chemie, Bd. VII (1877), pp. 192-4.

‡ Archiv f. exp. Pathol. u. Pharmakol., Bd. 7, p. 166, in paper by F. Walter: Untersuchungen über die Wirkung der Säuren auf den thierischen Organismus.

EXCRETION OF NH₃ DURING PERIOD OF NO-LIME.

	Amount of urine in cc	Reaction.	NH₃ in 20cc. of urine.	NH₃ in noon and evening urines.	NH₃ in morning urine.	NH₃ in the 24 hours urine.	
August 14.	noon } evening } 350.	weakly alkaline. } acid. }	0.01008	0.18093	..	0.3517	One kilogram of Spratt's biscuits consumed daily.
	morning 180.	acid.	0.01898	..	0.17082	..	
August 15.	noon } evening } 350.	weakly alkaline. } " " }	0.0094	0.1645	..	0.3132	
	morning 250.	acid.	{ Not determined. Accident.		0.1487*	..	
August 16.	noon } evening } 400.	weakly alkaline. } " " }	0.0044	0.0880	..	0.2361	
	morning 280.	acid.	0.01658	..	0.1481	..	
August 17.	noon } evening } 337.	weakly alkaline. } " " }	0.00638	0.1075	..	0.2525	
	morning 250.	acid.	0.0116	..	0.1450	..	
August 18.	noon } evening } 281.	weakly alkaline. } " " }	Not determined. Accident.	0.13197†	..	0.2729	
	morning 218.	acid.	0.01293	..	0.14693	..	
August 19.	noon } evening } 253.	weakly alkaline. } " " }	0.00924	0.11688	..	0.2407	
	morning 242.	acid.	0.01024	..	0.1239	..	

* This number was found by using an average for the NH₃ in 20 cc. of morning urines.
† This number was found by using an average for the NH₃ in 20 cc. of the evening and noon urines. The occasional use of an average or mean value in calculating the NH₃ in half of the twenty-four hours urine cannot appreciably affect the results of such a long series of analyses as the above, where two separate ammonia determinations are made in the twenty-four hours.

EXCRETION OF NH₃ DURING THE PERIOD OF FEEDING LIME.

	Amount of urine in cc.	Reaction.	NH₃ in 20 cc. of urine.	NH₃ in noon and evening urines.	NH₃ in morning urine.	NH₃ in the 24 hours' urine.	Weight of Spratt's biscuits consumed, in kilogram.
August 23.	noon } evening } 365.	weakly acid. } alkaline. }	0.00621	0.11643	..	0.2573	0.635
	morning 305.	acid.	0.00924	..	0.14091	..	..
August 24.	noon } evening } 210.	alkaline. } " " }	0.00386	0.04053	..	0.1808	0.710
	morning 257.	weakly acid.	0.01092	..	0.14032	..	..
August 25.		No analyses made because the morning urine not yet strongly alkaline.					
August 26.	noon } evening } 360.	alkaline. } " " }	not determined.	0.1335*	..	0.2342	0.830
	morning 125.	" "	0.01612	..	0.1007	..	..
August 27.		Results damaged owing to the occurrence of an accident while catching the urine.					0.770
August 28.	" " "	" " "	" " "	" "	..	..	0.625
August 29.	noon } evening } 210.	strongly alkaline gives } off much NH₃. }	0.00672	0.08232	..	0.1831	0.875
	morning 200.	" " "	0.01008	..	0.1008	..	
August 30.	noon } evening } 255.	strongly alkaline gives } off much NH₃. }	0.0084	0.1051	..	0.1739	0.625
	morning 200.	" " "	0.00688	..	0.0688	..	
August 31.	noon } evening } 362.	strongly alkaline gives } off much NH₃. }	0.0049	0.0887	..	0.2425	0.615
	morning 145.	" " "	not determined.	..	0.0538*	..	
September 1.	noon } evening } 200.	strongly alkaline gives } off much NH₃. }	0.01192	0.1192	..	0.1937	0.875
	morning 185.	" " "	0.00806	..	0.0748	..	
September 2.	noon } evening } 270.	strongly alkaline gives } off much NH₃. }	not determined.	0.10017	..	0.1483	..
	morning 205.	" " "	0.0047	..	0.0481*	..	

* These values were found by using averages for the morning or afternoon urines, as the case might be, as already explained.

chloride and 5 to 6 volumes of a mixture composed of two volumes of absolute alcohol and one volume of ether, and allowed to stand in a cool place for 24 hours. The precipitate is then collected and thoroughly washed with ether and alcohol, and after drying is reduced with zinc and hydrochloric acid at a moderate temperature. When the precipitate of platinum salts has been entirely decomposed and the filtrate from it is colorless the latter is distilled with magnesium oxide, the distillate is caught in a properly arranged flask containing 10 cc. of normal sulphuric acid and titrated back with ¼ normal sodium hydrate solution.

It did not seem necessary to put the dog into nitrogenous equilibrium, for food and other conditions remaining constant, any strikingly large variation in ammonia excretion during the lime treatment could only be referred to the lime as its cause. The food consumed by the dog consisted of Spratt's biscuits and was carefully weighed before and during the period of lime treatment; the dog was also weighed before beginning the experiments at the end of the no-lime series of analyses and again at the close of the lime series. During the time of the analyses the dog was confined in a roomy cage, the urine, however, was caught three times a day, the dog having been trained to urinate into a glass vessel when presented. In these quantitative experiments in which Spratt's biscuits were fed no constipation followed the lime treatment for the reason that this food tends to cause looseness of the bowels. The tables, page 39, contain the results of the ammonia estimations during the periods of the no-lime and of the lime treatment.

The dog's weight on the 8th of August was found to be 45.5 kg. On the 22nd of August the dog's weight was again taken and was found to be 47.25 kg. On the 6th of September some days after the close of the lime period it was found to be 47.5 kg. On the 21st of August milk of lime was mixed for the first time with the food. A glance at the columns in which the total NH_3 excretion for the 24 hours is put down will make it evident how marked is the falling off in the ammonia output when once the dog's system is thoroughly under the influence of slaked lime. If we entirely neglect the circumstance that the dog increased more in weight during the first or no-lime period than during the time of the lime treatment, since it is impossible to determine by calculation what relation this fact bears to the ammonia excretion, and if we assume that the NH_3 excretion is proportional to the amount of food digested, and if we furthermore make the proper correction in the numbers that represent the NH_3 output during the lime period, we shall still have a large unaccounted-for deficit in NH_3 excretion. Thus during six consecutive days of no-lime and a total consumption of six kg. of Spratt's biscuits the total NH_3 output = 1.6671 grams NH_3; during *five consecutive days of lime treatment* (from the 29th of August to the 2nd of September inclusive), and during a total consumption of 3.845 kg. of Spratt's biscuits, the total NH_3 output = only 0.8415 gram. For six days at the same rate of food consumption and ammonia excretion the NH_3 output would have amounted to 1.0124 grams. If the dog had consumed in these six days of lime treatment 6 kg. of biscuits instead of 3.845 kg., and if the NH_3 excretion had increased

in proportion, we should have had an output of only 1.3131 grams. If this amount is compared with the output actually obtained in the six days of the no-lime period, viz. 1.6671 grams, we find that 21.23 per cent. less NH_3 is excreted in the 24 hours when dogs are fed with large quantities of slaked lime then when no lime is given. That the smaller amount of food taken during the period of treatment was not due to the lime taken was demonstrated by the fact that the dog did not again consume 1 kg. of biscuits after the cessation of the treatment. As has been remarked before, nothing abnormal could be detected in the dog's condition during the time of treatment. It must be evident, therefore, that lime-water if given in large quantities and continuously will lower the output of ammonia as markedly as do the carbonates of the fixed alkalis. I may remark in passing that such experiments as the above are the counterpart of those performed by Walter,[*] Hallervorden,[†] Coranda[‡] and Salkowski,[§] who found that the administration of hydrochloric acid greatly increased the ammonia output of the 24 hours' urine.

There are a few more questions touching this ammoniacal state of the urine that must be referred to. Thus, the morning urine for some time after the appearance of the free ammonia owes its alkalinity entirely and alone to the ammonia. A strip of red litmus moistened with morning urine, if allowed to dry in an atmosphere free from the fumes of ammonia and volatile acids, or placed under the bell jar of an exsiccator, quickly takes on its original red color, thus demonstrating that the alkalinity of the urine in question is due solely to the ammonia emitted by it. Such a specimen of urine, if evaporated somewhat on the water-bath and then restored to its original volume by the addition of water, will show a weakly acid reaction in place of its former markedly alkaline reaction. The noon and evening urines owe their alkalinity partly to stable salts, for a strip of red litmus paper dipped into them retains its blue color on drying. The behavior of the morning urine,[||] then, does not support the opinion that the ammonia emitted by it is driven out by some salt of the fixed alkalis or alkaline earths, otherwise one would suppose that a strip of red litmus would remain blue after the evaporation of the ammonia. We must look, therefore, to some unstable compound that breaks down of its own accord as the source of the free ammonia. One such compound known to us is sodium ammonium phosphate, $PO\begin{cases} ONa \\ ONH_4 \\ OH \end{cases}$, found in guano and in inspissated urine, an aqueous solution of which liberates ammonia even at ordinary temperature in accordance with the following formula of decomposition: $PO\begin{cases} ONa \\ ONH_4 \\ OH \end{cases} = PO\begin{cases} ONa \\ OH \\ OH \end{cases} + NH_3$. But we shall give reasons that make it more than probable that the ammonia about whose source we are concerned does not leave the kidney in the form of this phosphate.

[*] Archiv f. exp. Pathol. u. Pharmakol., Bd. VII, pp. 148–178.
[†] *Ibid.* Bd. XII, pp. 237–75.
[‡] *Ibid.* Bd. XII, pp. 76–96.
[§] Archiv f. pathol. Anat. u. Physiol., Bd. 58, p. 23.
[||] After long feeding with lime the morning behaves more like the day urines.

We have thus far dealt with the following characteristics of lime urine: the deposition of triple phosphates while the urine is still in the bladder, the spontaneous liberation of much ammonia, its high alkalinity, and the presence of spherules of calcium carbonate. The addition of a few drops of strong hydrochloric acid to a specimen of lime urine generally causes a marked effervescence. That the freshly voided urine contains much carbon dioxide is shown by passing a current of washed air through it and then into a clear solution of barium hydrate, and this may be kept up for many hours without exhausting the supply of CO_2 in the urine. Unfortunately no quantitative analyses were made of the amount of CO_2 that can be pumped out of such a lime urine. Boiling the urine throws down a granular sediment that is dissolved with effervescence on the addition of an acid, and therefore contains $CaCO_3$. Has the frequent appearance of spherules of $CaCO_3$ in the urinary sediment and its high content of $CaCO_3$ in a state of solution any connection with the large amount of ammonia given off by the lime urine? or is the $CaCO_3$ that is thrown down when the urine is boiled present only in the form of the soluble acid salt, $Ca(HCO_3)_2$? If the latter assumption holds good, then no further precipitation of $CaCO_3$ should occur on boiling a urine from which all the bicarbonate of calcium has previously been removed. To accomplish this, one has but to add some freshly prepared milk of lime and shake vigorously for ten or fifteen minutes, then allow to settle for half an hour, then filter and add to the filtrate a few drops of concentrated solution of calcium chloride to decompose any ammonium carbonate that might perchance have escaped the decomposing action of the milk of lime, then add a knife-point full of freshly prepared crystalline calcium carbonate which has been kept under distilled water in a perfectly tight bottle, again shake vigorously for ten minutes, allow to settle for half an hour and again filter. The knife-point full of crystalline calcium carbonate is added for the purpose of inducing any amorphous or semi-crystalline calcium carbonate that may have remained in solution after the first shaking with milk of lime to fall out as crystalline calcium carbonate. This method, if carefully followed out with properly prepared reagents, will remove all the bicarbonate of calcium from an ammoniacal solution containing it, such as the lime urines in question. But if the urine from one of the lime-fed dogs is treated in this way it will still deposit calcium carbonate on boiling, and the precipitate formed at the bottom and sides of the test-tube will dissolve with effervescence on the addition of an acid. A few bubbles of CO_2 may be obtained from a normal urine treated in this way if the shaking-out methods that we have outlined are carelessly employed, but the much more marked evolution of CO_2 obtained when a lime urine is similarly treated cannot be referred to bicarbonate of calcium that has escaped precipitation. One must conclude, therefore, that the lime urine contains in solution a compound that is not precipitated by the reagents that throw down bicarbonate of calcium, but that it agrees with the bicarbonate in its inability to withstand boiling, like it depositing $CaCO_3$ when its aqueous solutions are heated. This compound has been shown by Mr. Muirhead and myself to be calcium carbamate, a salt remarkable

for the instability of its aqueous solutions even at ordinary temperatures. Thus, a clear filtered solution of this salt remains clear at ordinary temperatures for a few minutes only, soon becomes turbid from the deposition of calcium carbonate, and gives off ammonia and CO_2. At room temperature this decomposition is not complete, that is, not all the carbamate in solution breaks up at once, for when once NH_3 has appeared it exercises an inhibitory influence on the further decomposition so that some of the salt may remain undecomposed for a long time. On heating to about 55°, or on boiling, the dissociation is rapid and complete. The following equation illustrates the manner of this decomposition:
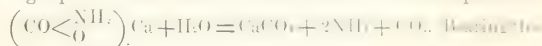
$$\left(CO{<}^{NH_2}_{O}\right)Ca + H_2O = CaCO_3 + 2NH_3 + CO_2.$$ Bearing the properties of calcium carbamate in mind, we can explain all the peculiarities of the lime urine, namely, the presence of free ammonia, of much CO_2, the frequent occurrence of $CaCO_3$ in the urinary deposit, the constant and large precipitation of ammonio-magnesium phosphate in the bladder, and the presence of calcium carbonate in solution after removing any bicarbonate of calcium that may have been present. A connection is therefore most clearly established between these various occurrences if we can prove that calcium carbamate is really present in the lime urines. The behavior of the lime urines toward boiling after the previous removal of any bicarbonate of calcium possibly present, made us suspect the presence of the carbamate, and encouraged us to attempt its isolation. To this end we treated from four to five litres of the urine of dogs that were being fed on meat and lime, by a method first suggested by Drechsel[*] for the isolation of carbamic acid from the urine. Briefly stated, this method consists in expelling the ammonia of the urine with milk of lime, and getting rid of any ammonium carbonate or bicarbonate of calcium that may be present in the way already described, then precipitating in the cold with at least three volumes of cold absolute alcohol, allowing to stand on ice for fifteen hours, collecting the precipitate as rapidly as possible by filtering under pressure, redissolving it when dry in ammonia, and reprecipitating with cold absolute alcohol by the fractional method. The third fractional precipitate with absolute alcohol was allowed to stand on ice for fifteen hours, the precipitate collected by filtering under pressure, washed with absolute alcohol and ether to remove all traces of moisture and ammonia and then dried in vacuo over sulphuric acid. This final precipitate occurs, when dry, in the form of white porous pieces that yield when pulverized a slightly yellowish powder almost entirely soluble in water. Its aqueous solution behaves entirely like solutions of calcium carbamate synthetically[†] prepared in the laboratory. Thus, the clear filtrate becomes turbid in a few moments, throwing down crystalline calcium carbonate and giving off ammonia. On heating and even more, or on boiling, this decomposition takes place immediately. Unfortunately this white powder obtained by us isolated from the urines is not pure calcium carbamate, it consists in large part of calcium sulphate of calcium, and according to

* Drechsel u. Abel, Archiv f. (Anat. u.) Physiol. 1891, p. 238.
† Journ. f. prakt. Chem. (T.) Bd. 16, pp. 188-92.

Nencki and Hahn[*] who have more recently examined it, also contains small quantities of a salt of acetic acid.

The equation for the decomposition of calcium carbamate in an aqueous solution that has already been given, namely, $\left(CO<^{NH_2}_{O}\right)_2 Ca + H_2O = CaCO_3 + 2NH_3 + CO_2$, at once suggests a method of gravimetric analysis for this salt, even though other compounds be present, provided none of these yield ammonia or calcium carbonate when the solution is boiled. That is, if a solution of this salt be decomposed by boiling, and the ammonia arising from its decomposition be distilled off and caught, we ought to find two molecules of ammonia to one of calcium carbonate left as a crystalline sediment in the flask. To test the question we dissolved 0.6803 gram of an impure specimen of calcium carbamate that had been prepared synthetically some months before and which had therefore largely broken down, in water, filtered off quickly from the large insoluble residue of calcium carbonate directly into the decomposition flask and applied heat. The ammonia given off was taken up in hydrochloric acid and estimated as a platinum double salt, the sediment of calcium carbonate in the decomposition flask was collected, dried, weighed, incinerated and estimated as calcium oxide. We found 0.0265 gram CO_2 : 0.02029 gram of NH_3. The proportion $CO_2 : 2NH_3$ demands for 0.0265 CO_2, an amount of NH_3 represented by 0.02047 gram, showing a very close agreement. These results prove that this analytic method will enable us to demonstrate the presence of this salt in solution, provided, as we have said, no other compounds that yield either ammonia or calcium carbonate on boiling are present. We have made a number of analyses of the crude carbamate isolated by us from lime urines, but none of them have been satisfactory from the quantitative point of view. In all cases the amount of $CaCO_3$ found was far in excess of that required by the proportion $CO_2 : 2NH_3$. Thus, in one experiment we found 0.0238 CO_2 : 0.01018 NH_3, but 0.0238 CO_2 requires 0.01839 NH_3. In a second analysis we found 0.0211 CO_2 and 0.0124 NH_3. Our proportion, however, demands for 0.01211 CO_2 an amount of NH_3 represented by 0.0163. It is perhaps permissible to assume that a basic salt had been formed by the action of the milk of lime on the normal carbonate during the tedious process of isolation already described. The basic salt would have the formula $H_2N.CO.O.Ca.OH$, its aqueous solutions would decompose on boiling according to the following equation, $H_2N.CO.O.Ca.OH = CaCO_3 + NH_3$, and its presence in varying proportion would therefore cause a variation in the amount of CO_2 found on decomposing the crude product isolated from the urine. A fuller discussion of this question and more complete details of the above analyses will be found in our previous papers on this subject.[†] Whatever opinions may be held as to the presence of a basic carbamate, it is

certain that the powder isolated by us contains as a further impurity an unknown compound which also deposits $CaCO_3$ on boiling but which yields no ammonia. We know this from the behavior of the filtrate of a solution of the crude carbamate from which all traces of carbamic acid have been removed by boiling till no more ammonia is given off. If such a filtrate is again subjected to a half-hour's boiling, or is allowed to stand for some hours, calcium carbonate is again deposited, though only in small quantities, while no more ammonia is liberated. We have, therefore, sufficient explanation for the high percentage of calcium carbonate found by us and for the unsatisfactory outcome of our quantitative analyses. But although the quantitative results are far from satisfactory, the behavior of aqueous solutions of the crude product so frequently referred to is so entirely like that of a solution of synthetically prepared carbamate, especially in respect to the rapid deposition of $CaCO_3$ and the liberation of NH_3, that we are justified in concluding that the lime urines contain calcium carbamate, and we are all the more justified in this conclusion since a qualitative analysis of the powder demonstrates nothing that could otherwise explain the contemporaneous appearance of $CaCO_3$ and NH_3 on boiling.

It therefore only remains for us to discuss the question whether the carbamate found by us may not be an artificial product, the result of the various manœuvres employed in its isolation. Every normal urine contains small quantities of CO_2[*] either in the free state or in combination, as well as salts of ammonia from which the ammonia is set free when the urine is shaken with milk of lime, and hence it might be inferred that we really have all the conditions for the artificial formation of carbamic acid. Drechsel[†] has demonstrated in his research on the oxidation of glycocoll, leucin and tyrosin that carbamic acid is formed wherever CO_2 and NH_3 meet in the nascent condition. But the circumstances in the two experiments differ widely, for the addition of an excess of milk of lime to the urine binds the small amount of CO_2 that is present at the same time that it liberates the NH_3; certainly these chemical conditions cannot be likened to those met with in the oxidation experiments just referred to, in which compounds containing nitrogen and carbon are oxidized in alkaline solutions, and in which nascent NH_3 and CO_2 are able to act on each other. They differ, too, from those obtaining in the ordinary method of preparing calcium carbamate, namely, the passing of a continuous current of CO_2 into a concentrated solution of ammonia holding milk of lime in suspension. The opinion that the calcium carbamate found by us is not an artificial compound produced in the course of our manipulations, but that it is excreted as such by the kidneys, also receives support from the following experiment. A liter and a half of human urine of acid reaction was treated in the manner already described for the isolation of carbamic acid. The final product was dissolved in water, filtered into a test-tube and boiled; a little calcium carbonate was deposited, but no ammonia was given off. The urine in question, therefore, contained no carbamic acid and the manipulations employed

* Archiv f. experimentelle Pathologie und Pharmakologie, Bd. 32, pp. 200-8.

†Abel u. Muirhead : Archiv f. exp. Pathol. u. Pharmakol., Bd. 31, pp 21-3 : Drechsel u. Abel : Archiv f. (Anat. u.) Physiologie, 1891, pp. 239-2. See also Hahn, Massen, v. Nencki and Pawlow in Archiv f. exp. Pathol. u. Pharmakol., Bd. 32, pp. 197-200, or Archives des Sciences Biologiques, St. Pétersbourg, t. I, no. 4, pp. 401-95.

* Pflüger's Archiv, Bd. II., p. 156, and Bd. VI., p. 93.
† Journal f. prakt. Chemie (2), Bd. XII., p. 422.

in its isolation are not capable of causing its appearance. It is not to be inferred, however, that an acid urine cannot contain carbamic acid. Nencki and Hahn* have met with it in an acid urine of the horse.

It will be remembered that we occasionally found small quantities of free ammonia in the urine of dogs fed on the ordinary refuse of the butchers' shops even when no lime had been mixed with their food. It seemed worth while also to isolate the carbamic acid from such urines. The yield was far less than when lime was mixed with the food, the final product† isolated from the former urines furnishing only ⅓ as much calcium carbamate as the latter.

Do the experiments that we have detailed apply to human urine? We are prepared to think that they do, and we are confident that all cases of persistent and marked alkalinity of the urine due to long administration of much lime water will be found on examination to be instances of ammoniacal urine due to the presence of a salt of carbamic acid. We were allowed through the kindness of a friend to try the following experiment. A four-year-old boy was given two teaspoonsful a day of very thick cream of lime well distributed in his milk and other food. No digestive disturbances were observed to follow the administration of this quantity of lime but on the evening of the third day the child's urine exhibited all the characteristic reactions of a dilute solution of calcium carbamate. It goes without saying that the administration of lime water even in large quantities would have required a much longer time to produce a like effect.

This case together with the one cited at the opening of this paper suffice to show that so simple a drug as lime-water may cause hitherto unsuspected changes in the urine. Whether the ammonia that is given off by these urines may give rise to any clinical symptoms, such as an increased irritability of the bladder, we are not yet able to say.

In concluding this part of the subject I may be permitted for the sake of clearness to give a brief resumé of the results.

1. The urine of dogs fed on meat becomes strongly alkaline when slaked lime is mixed with the food, and gives off ammonia and carbon dioxide spontaneously.

2. It contains absolutely less ammonia in the 24 hours than normal urine.

3. It always contains a calcium salt in solution which is not bicarbonate of calcium, and which decomposes with precipitation of calcium carbonate if the urine be allowed to stand.

4. The lime urine exhibits all the characteristics of a weak aqueous solution of calcium carbamate, and a white powder may be isolated from it which behaves in every way like synthetically prepared calcium carbamate, except that it gives less accurate results on being subjected to quantitative analysis.

5. Human urine behaves exactly like that of the dog when large quantities of lime have been taken and it likewise contains calcium carbamate.

Why carbamic acid should appear in such noticeable quantities after the administration of lime we can only surmise. It seems plausible to argue that the body avails itself of its readily soluble calcium salt to get rid of the excess of calcium that has been absorbed. That calcium is absorbed in not inconsiderable quantities has been repeatedly demonstrated, and that there are in the urine but few acids that can form soluble calcium compounds is apparent, but in the present state of our knowledge we can furnish no adequate explanation for the appearance of this acid under the circumstances described in this paper.

The fact that carbamic acid is an important intermediate product of the metabolism of the body gives to its appearance in the urine a more than merely clinical or pharmacological importance. Recent researches have made it more than probable that it is the chief immediate precursor of urea, and that it therefore plays a great part in the complicated chemical processes to which the proteïds of our food are subjected before their nitrogen is eliminated in the urine.

As no other theory of the formation of urea in the body has as good an experimental foundation as this, which I may call the carbamic acid theory, I shall confine myself to a short account of the experimental work that has established this theory in its present position. Twenty-five years ago Schultzen and Nencki* instituted a series of feeding experiments in order to learn whether the amido acids such as glycocoll, leucin and tyrosin, which are always to be found among the decomposition products of proteïds and proteïd-like bodies when they are subjected to hydrolytic decomposition,† had any connection with the formation of urea. They found that the nitrogen of these amido-acids, especially of glycocoll and leucin, reappeared in the urine in the form of urea, and this observation first suggested that carbamic acid is formed in the economy as an intermediate product in the course of their oxidation to urea. Salkowski next demonstrated‡ that when taurin is given to human beings it reappears to some extent in the urine as a salt of an acid called by him tauro-carbamic, but more properly named uramido-isæthionic acid, since its formula obliges us to look upon it as one of the uramido-acids, in other words, as a substituted urea.

Thus, $\begin{matrix} CH_2 \cdot NH \cdot CO \cdot NH_2 \\ | \\ CH_2 \cdot SO_2H \end{matrix}$ = amido-isæthionic acid. The formation of this compound in the body must, however, be looked upon as supporting the opinion that carbamic acid really exists in the economy, and that it can combine with certain compounds that have been introduced.

Schultzen's§ experiments in 1872 on the fate of sarkosin in the organism of the dog, which were for a long time looked upon as having furnished strong probable evidence or even proof that certain amido-acids play an important rôle as precursors of urea, and were, in consequence,

* See Hahn, Massen, v. Nencki and Pawlow, Archiv f. exp. Pathol. u. Pharmakol., Bd. XXXII., p. 200.

†Abel and Muirhead, loc. cit., p. 23.

* Berichte d. deutsch. chem. Gesellsch., ... und Zeitschr. f. Biolog., Bd. 8, p. 124.

† ... amido-acids ... glutin ... proteïds proper.

‡ Berichte d. deutsch. chem. Gesellsch., 1873, 6, pp. 744–6, pp. 1191–3 and 1312.

§ Ber. d. deutsch. chem. Gesellsch., 1872, 5, pp. 67–8.

v. Mering,* Salkowski† and Schiffer‡ to be far from conclusive for this theory.

A perusal of the papers of the investigators just named, especially of the historical introduction to Schiffer's paper, will give an idea of the interest aroused by Schultzen and Nencki's work, and of the laborious researches that have since been devoted to the fate in the body of various amido-compounds, researches which, it was hoped, would throw light on the formation of urea in the body.

The result of all this work on the amido-acids was that the carbamic acid origin of urea could not be accepted as demonstrated. But meanwhile (1875) appeared Drechsel's§ notable paper already referred to, on the oxidation of glycocoll, leucin and tyrosin, and on the occurrence of carbamic acid in the blood. Drechsel demonstrated that when these compounds are oxidized in ammoniacal solution with ammonium permanganate, carbamic acid is always to be found among the oxidation products. Urea is not formed. Aqueous solutions of glycocoll oxidized with potassium permanganate also yield carbamic acid, and it is thus demonstrated that carbamic acid can be produced when there is no ammonia originally present. Otherwise it might have remained an open question whether the carbamic acid formed in the ammoniacal solutions of the first experiments was not the result of the interaction of nascent CO_2 with the ammonia originally present. In this paper Drechsel also furnished proof of the existence of a salt of carbamic acid in the blood of the dog. These results both chemical and physiological were challenged by Hofmeister,‖ who claimed to have demonstrated that the reactions obtained by Drechsel were to be referred to other substances than carbamic acid—the presence of unprecipitated calcium carbonate, oxaminic acid, etc. Drechsel** afterward repeated with great care those parts of the research upon which doubt had been thrown, and demonstrated to the satisfaction of workers in this field that his original position was well taken. Some years later Drechsel †† again made an important experimental contribution to this subject by effecting the dehydration of ammonium carbamate to urea in an aqueous solution by means of a rapidly interrupted electric current, thus imitating the conditions under which urea is formed in the human body more closely than when its precursors are heated to high temperature in sealed tubes, etc. The formation of urea by this electrolytic method is the result of an alternate oxidation and reduction. Now the living protoplasm of the body cells is endowed with oxidizing and reducing powers, and although the exact chemical explanation of these processes is not at hand, we have only to assume that these powers are in some instances exercised in an alternating manner to give Drechsel's experiments a wide application.

From our present knowledge of the locality in which urea is mainly formed, thanks to the brilliant experimental researches of W. von Schröder,* we may think of the liver cell as exercising an oxidizing and reducing action on the carbamate of ammonia, with the resulting formation of urea. These processes may be expressed in the following terms:

I. $NH_2.CO.O.NH_4 + O = NH_2.CO.O.NH_2 + H_2O.$
II. $NH_2.CO.O.NH_2 + H_2 = NH_2.CO.NH_2 + H_2O.$
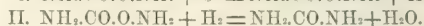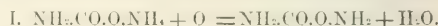
With the help of this principle of an alternating oxidation and reduction, first definitely stated and copiously illustrated by Drechsel, many of the hitherto inexplicable chemical phenomena of the body become clear to us. Such are the many synthetic processes accompanied by water abstraction and the reductions that so frequently interrupt the step-by-step oxidations that are continually going on, and which lead to the formation of a large number of interesting intermediate products.†

Further experimental evidence of the existence of carbamic acid in the economy was furnished by Drechsel and Abel in their discovery of its occurrence as a normal product in the urine of the horse. The very interesting and novel experiments recently performed by Hahn, Massen, v. Nencki and Pawlow‡ have shown most convincingly that this acid has the importance that has for some time been attributed to it as an intermediate product in the breaking down of proteids within the body. These experimenters performed v. Eck's operation on dogs, that is, they tied the portal vein close to its entrance into the liver and established a free communication between this vessel and the inferior vena cava, so that all the blood from the portal district passed directly into the inferior vena cava and was entirely excluded from the liver. I must refer to the original treatise for the details of the operation, for the variations in the experiment, such as the partial or total resection of the liver, ligature of the hepatic artery in addition to the establishment of Eck's fistula, and for the details of the large amount of chemical work contained in this valuable contribution. After a variable period of time the animals thus operated upon manifested grave symptoms referable to the nervous system. There appeared a stage of somnolence with ataxia, followed by one of excitation with ataxy, analgesia and amaurosis, this again passing into a stage of clonic and tetanic convulsions, which were followed by coma sometimes terminating fatally. Chemical analyses demonstrated the presence of ammonium carbamate in largely increased quantity in both the blood and urine of those animals that had

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* Berichte d. deutsch. chem. Gesellsch. 1875 (8), pp. 584–9.

† Zt. f. physiol. Chemie, Bd. IV., pp. 55–85, and pp. 100–33 ; also Ber. d. d. chem. Gesell. 1875, Bd. 8, pp. 638–40.

‡ *Ibid.* Bd. V., pp. 257–66, and Bd. VII., pp. 479–87.

§ *Loc. cit.* pp. 417–26.

‖ Journal f. prakt. Chemie (2), Bd. XIV., pp. 173–83, and Pflüger's Archiv, Bd. XII., p. 337.

** Journal f prakt. Chemie (2), Bd. XVI., p. 169. See also D.'s important paper on the preparation and description of a number of new salts of carbamic acid, *ibid.* pp. 180–200, for valuable points bearing on the properties of carbamic acid, and notably of its calcium salt.

†† Journal f. prakt. Chemie (2), Bd. XXII., pp. 476–88 ; Archiv f. (Anat. u.) Physiol., 1880, p. 550.

* Archiv f. exp. Pathol. u. Pharmakol., Bd. XV., pp. 364–402, and *ibid.* Bd. XIX., pp. 373–86.

† Drechsel, Archiv f. (Anat. u.) Physiol. 1891, pp. 251–4. Nencki, Archiv f. exp. Pathol. u. Pharmakol., Bd. 32, p. 206. Baumann, Zeitschrift f. phys. Chem., Bd. XV., pp. 276–7.

‡ Archives des Sciences Biologiques, t. I., no. 4, pp. 401–97, and Archiv f. exp. Path. und Pharmak., Bd. 32, pp. 161–211.

FIG. 1.

shows the tumor in the vault of the vagina below
and posterior to the urethra.

FIG. 5.

View of tumor with the patient in left lateral position.

FIG. 6.

Actual size of tumor.
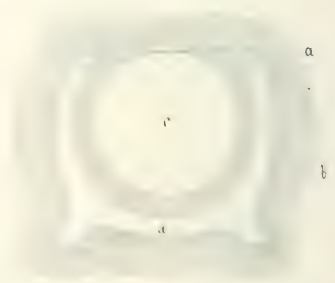
FIG. 3.

Cross Section.—a represents the urethra; b the opening between urethra
and sac; c the sac of the vagina.

FIG. 2.

shows the opening between
laid open and thus

FIG. 4.

Shows the opening in the floor of the urethra as viewed through the
urethral speculum.

the nervous seizures just referred to. Pharmacological experiments also demonstrated a very satisfactory agreement in the symptoms of these nervous seizures resulting from the establishment of an Eck's fistula, with those observed in healthy dogs after the intravenous injection of very large doses of sodium carbamate (0.3–0.6 gram pro kilo). A differential test of great value is seen in the fact that a healthy animal is not poisoned by the administration of large doses of sodium carbamate by the mouth after previous neutralization of the hydrochloric acid of the stomach, whereas an animal that has been operated upon responds at once to this method of administration with the severe symptoms already referred to. It is evident, then, that in this latter case the greatly damaged liver is no longer able to convert with sufficient rapidity the carbamic acid absorbed from the digestive tract into the harmless urea. Meat-eating has for dogs with an Eck's fistula the same consequences as the administration of a carbamate by the mouth. Interpreting their experiments in the light of previous knowledge as to the occurrence of carbamic acid and as to the functions of the liver in the synthesis of urea, Hahn, Massen, v. Nencki and Pawlow conclude that ammonium carbamate is formed everywhere in the tissues as the final stage of the decomposition of proteids and that it is carried to the liver and there converted into urea.

It would take us beyond the scope of this paper to discuss the chemical processes antecedent to the appearance of carbamic acid in the tissues, or how much urea is formed in other ways than by passing through the carbamic acid stage, or to raise the question as to the bearings upon the carbamic acid theory of the increased excretion of ammonia that has been observed in the terminal stages of hepatic cirrhosis, diabetes mellitus, etc. When it is borne in mind that carbamic acid makes its appearance whenever nitrogenous principles such as occur in the body are oxidized in alkaline media, that its salts occur in the blood and urine of animals and in the urine of human beings, that it can be converted into urea in the laboratory by simple chemical processes not foreign to the body, that it will yield urea if it be conducted through a " surviving " liver, and that it appears in increased quantity in the blood and urine under experimental conditions in which the functions of the liver have been deranged, it will be admitted that we have good reasons for believing that it bears an important relation to urea, and that its study in normal and pathological conditions must be of interest and value.

ABSCESS (?) IN THE URETHRO-VAGINAL SEPTUM.

BY T. S. CULLEN, M. B., *Assistant Resident Gynecologist, the Johns Hopkins University.*

This case of Dr. Kelly's entered the Hospital, January 16, 1894. Is colored, aged 31, married, has no children, and is a hard worker, general health good. Immediately after marriage she complained of painful coitus. Four years ago she noticed a small lump about 2 cm. in diameter in the vault of the vagina. At first it was very soft and tender but afterward grew hard. She noticed an occasional slight discharge of pus from the urethra during the intervals between micturition. Examination of the chest and abdomen proved negative. Under anæsthesia an ovoid mass 3x2½ cm. was found in the anterior vault of the vagina, pressure on which caused an escape of pus from the urethra. On passing the speculum into the bladder the base was found markedly injected. Withdrawing the speculum slightly, a little depression was seen in the urethral floor, and a probe passed into this depression entered a small sac. On pressing the sac and looking in the speculum one could see the pus oozing up from this depression in the urethral floor. The patient was placed in the left lateral position to secure a good exposure. A small elliptical incision was made over tumor and the parts dissected back to the urethra, the sac cut away and the opening closed by 10 silk sutures, which were removed in 11 days; the union was perfect. The patient was discharged February 16th.

MICROSCOPICAL EXAMINATION OF THE SAC.

The outer surface of the sac showed typical vaginal mucous membrane; beneath this was connective tissue, rich in oval and spindle-shaped cells. The blood-vessels were numerous and dilated. Just beneath the inner wall of the sac were irregular aggregations of polynuclear leucocytes in the tissue. The inner surface was rough and presented numerous elevations and depressions. In some of these depressions irregularly oval cells with small oval nuclei were found either in short rows or arranged promiscuously. These appeared to be identical with urethral epithelium, thus indicating that the sac was a urethral diverticulum.

Very little is said in text-books concerning this subject, and in fact the majority do not mention it. Hey,[16] in his Surgery, published in Philadelphia in 1805, mentions a case which he treated in 1786. A woman for 15 years had sudden and irregular purulent discharges from the urethra. These were never mixed with urine. Examination revealed a roundish tumor at the external os. On pressing this, pure pus escaped from the urethra, yet urine drawn from the bladder did not contain the least purulent matter. A probe introduced into the urethra could be pushed into the most dependent part of the tumor. The tumor was longitudinally incised and packed with lint. Its vaginal covering was found to be thickened and the cyst-lining was smooth. The patient speedily recovered. From this time until Foucher[9] reported a case, in 1857, no further cases can be found in the literature. In 1875 Tait[40] published a case, closely followed by Gillette,[14] in 1876. Since then scattered cases have been published in France, Germany, Great Britain and America.

SYMPTOMS.

The first symptom manifested is usually painful micturition.

which gradually increases in severity after a period varying from a few days (de Bary[1]) to several months (Hermann[18]). There is marked pain during micturition, followed by a sudden discharge of ammoniacal urine or pus which gives immediate relief. About this time a swelling is noticed in the vaginal vault. It is usually situated in the mid-line about 1 to 2 cm. behind the external orifice of the urethra. The tumor varies in size from a marble (Routh[34]) to a hen's egg (Tait[41]), is tender and fluctuant. On pressure it diminishes in size, and discharge of ammoniacal urine or pus from the urethra follows. A catheter introduced along the anterior wall of the urethra will enter the bladder without difficulty, and usually clear urine escapes. If introduced along the urethral floor with its point directed downward it will enter the sac cavity. The patients are usually in good health and give no history of chills.

On changing from a sitting to a standing posture there will often be an escape of the sac contents, the first intimation to the patient being that the clothing is moist. Coition may also cause a discharge of the fluid (Giraud[15]). In one case (Santesson[37]), on pressure the contents escaped into the bladder instead of passing out of the urethra. Where the discharge is irritating there is excoriation of the external genitals and thighs. The sac opening in the urethra will admit as a rule a No. 6 catheter. The sac may have smooth glistening walls (Hey[16]), be lined by squamous epithelium (de Bary[1]), or have a ragged appearance with trabeculæ traversing its cavity (Routh[34]). Its contents are usually decomposed urine and pus cells, and where the sac contains calculi, blood cells are also found (Chéron[4] and Giraud[15]). In one of the cases where calculi were present the interior of the sac presented an ulcer at its most dependent part, which was probably due to mechanical injury produced by the calculus.

Age.—This condition has been found in a child one year old (de Bary[1]), and may occur in persons of any age (Chéron[4]); the usual age, however, is between 30 and 50.

Cause.—In speaking of the origin of these sacs it will be well to briefly run over the anatomy of the structures situated in the urethro-vaginal septum and also to describe the urethra.

In the urethro-vaginal septum there may be remains of Gartner's ducts as first described by Malpighi[27] in 1681, and again discovered by Gartner[11] in 1822. The latter first noticed them while injecting the lymph vessels in a cow. He was able to trace the duct upward nearly to the ovary, downward to the cervix uteri, and in later preparations found them opening into the vagina near the urethral orifice. He also found them in the pig. He compared this duct to the vas deferens in the male.

Jacobson[19] in 1830 obtained similar results, but described the ducts somewhat more minutely. Rieder[33] examined specimens from 40 human beings, and found remains of the ducts in 8 cases. He concludes that portions of the duct which remain until birth will persist throughout life. He agrees with Dohrn[6] that the duct is more commonly found on the right side, the left being obliterated by rectal pressure. At the lower part of the cervix uteri the duct is near the uterine lumen, then passes downward and outward over the vaginal vault close beneath the mucous membrane. He was never able to trace it to the sides of the urethra. The duct is lined by high cylindrical epithelium, which is loosely attached to its basement membrane, and may lie free in the lumen of the tube. It may, however, have two layers of cells. The connective tissue layer is about 17 μ thick. Then comes an inner longitudinal, a median circular and an outer longitudinal muscular coat.

Von Preuschen[31] found the ducts in a cat opening slightly above the urethral orifice. They were lined by cylindrical epithelium.

The urethra is lined by laminated epithelium and contains racemose glands and lacunæ.

Henle[17] in his text-book speaks of Morgagni's lacunæ as furrows and pockets of mucous membrane, and mentions branching glands lined by cylindrical epithelium. These glands sometimes contain yellow or brown laminated concretions like those found in the prostates of men.

Luschká[26] also speaks of lacunæ and glands. He says the lacunæ are "canal-like" and that they run in the direction of the urethra and are visible from without.

Oberdiech,[29] in examining the epithelium of the female urethra, also makes a distinction between the lacunæ and glands.

Lastly, Skene's[39] tubules, which have since been described by Schüller,[36] Kock[23] and Böhm,[3] the two latter saying that they are remains of Gartner's duct. These tubules are situated just within the urethral orifice on either side; they admit a probe 1 mm. in diameter for 5 to 10 mm.

The possible causes are:

1. Congenital cysts or those occurring in the new-born. The latter variety has been mentioned by Englisch,[8] who found that in new-born children, small oblong cysts are occasionally present in the urethra near its orifice. He suggests that these may in after life increase in size and give rise to the above condition.

2. A true urethral diverticulum where all the urethral coats take part. This is due to the wall becoming weak at one point (Lannelongue,[24] Priestley[32]).

3. Accumulation of secretions in a urethral gland.

4. Dilatation of a lacuna of Morgagni probably due to inflammation, closure of its orifice, and subsequent distension with secretion (Winckel[14]).

5. Dilatation and possible occlusion of Skene's tubules (Böhm[3]).

6. Arrest of calculi in the urethra, with a diverticulum forming to accommodate the same (Chéron,[4] Piedpremier[30]).

7. Traumatism, as a kick, or injuries during labor. Here an abrasion of the mucous membrane takes place and the urine gains access to the small pocket, decomposes and sets up an inflammatory process (Duplay[7]).

8. A suppurating cyst situated in the urethro-vaginal septum and afterward bursting into the urethra (Hermann[18]).

It is not difficult as a rule to differentiate between sac-like dilatations in the urethral floor and cysts of Gartner's duct. The latter cysts are generally about the size of a pea or cherry and have no communication with the urethra. Kiwisch[22] found five such cysts, one behind the other, and Boys de Loury[25] has seen a beaded row extending the whole length of the vagina. Veit[43] observed three similar cases which he accidentally noticed while making examinations.

Galabin's[10] second case is interesting in that the cyst had no opening into the urethra, but communicated with a tube running up as far as the cervix. This tube contained a watery and semi-purulent fluid.

A second and similar case has been reported by de Bary,[1] in which a cyst the size of a goose-egg was found in the urethro-vaginal septum. It contained a fluid which yielded albumen but no mucin. It was lined by polygonal flat epithelium. Both of these cases suggest the possibility of a cyst of the lower portion of Gartner's duct.

The *treatment* consists in the removal of the redundant tissue *in toto* by an elliptical incision, then a slight inversion of the mucous membrane and closure by silk sutures. The catheter should be passed three times daily for 3 to 4 days, and the patient should afterwards be advised to urinate in the genu-pectoral position for a week longer. In introducing the catheter, care should be taken to pass it along the anterior urethral wall.

Below is a list of the cases found in the current literature.

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10. Galabin : Chronic abscess of the female urethra. London Obst. Transactions, Vol. XXVIII, 1886, p. 186.
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13. Gervis : Chronic abscess of the female urethra. Lond. Obst. Trans., XXVIII, 1886, p. 186.
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TABLE OF SACS FOUND IN URETHRO-VAGINAL SEPTUM.

Reported by	Age.	Married or Single.	Chief Symptoms.	Duration.	Cause.	Operation.	Complications.	Result.
de Bary.	1		Bearing-down sensation at stool. Painful micturition. Small tumor in left vaginal vault just behind urethral orifice. Sac opened into urethra.			Removal of portion of sac wall and its contents.		Rapid recovery.

Reported by	Age.	Married or Single.	Chief Symptoms.	Duration.	Cause.	Operation.	Complications.	Result.
de Bary.	23	S.	Inmate of an asylum. Specimen found at autopsy.					
Batuard.	33	M.	Tumor size of a "nut" in ant. vaginal vault. Pressure over it caused escape of pus from the urethra.			Sac incised.	Prolapsus uteri. After operation incontinence of urine for 15 days.	Cured.
Chéron.	68	M.	(Renal colic three years before history was taken.) "Sand in urine." Hard mass felt in ant. vaginal wall, which, on passage of catheter into urethra, proved to be a stone embedded in a sacculation of the urethra.			Dilatation of urethra. Extraction of calculus.		
Chéron.	36		Two years before examination passed "sand" in urine. Painful micturition; small tumor in vaginal vault. Sac communicated with urethra and contained a small calculus.		Thinks it developed in a lacuna.	Not given.		Sac disappeared 4 months after operation.
de Cory.	40	M.	Painful micturition. Feeling of fulness in "lower abdomen." Great thirst and headache. Vagina hot and tender. Urethra felt like a large *roll* under finger. Slight fluctuation.			None. While at stool, felt something rupture and pus escaped from the urethra.		Wound healed completely.
Duplay.	23	M.	Painful micturition. Sudden involuntary discharge of small quantities of urine. Tumor size of walnut in ant. vaginal vault, fluctuant and tender. Pressure over it caused muco-pus to escape from the urethra.			Sac opened by thermocautery and packed with iodoform gauze.		Cured in 3 months.
Englisch.	35	M.	Painful micturition. Tumor in right vaginal vault, tense and fluctuant. *Did not communicate with urethra.*			Was opened throughout its entire length and packed with gauze.		Cured.
Foucher.	35	M.	Painful micturition. Tumor in right vaginal vault. This was tense and fluctuant (did not communicate with urethra).			Was opened from end to end and packed with gauze.		Cured.
Galabin.			"Swelling" in ant. vaginal wall, filled with purulent fluid and communicating with urethra.			Redundant tissue cut away and wound closed by sutures.		
Galabin.			Cavity in urethro-vaginal septum, communicating with a *tube* running upward toward the cervix and filled with semi-purulent contents. Did not communicate with the urethra.					
Gentle.	40		Painful micturition, the stream being forked or screw-like, with occasional sudden stoppage of flow. Afterward localized pain in the urethra. Tumor in vaginal vault. Catheter introduced into urethra entered sac easily and struck a calculus.			Incision in vaginal vault and removal of calculus.		Rapid recovery.
Gervis (1886).			Painful micturition. Pain referred to vagina.			None. Broke spontaneously into urethra.		Cured.
Gillette (1876).	31	M.	Painful micturition. Sudden discharge of urine on standing or during coition. Ovoid mass 4½x3 cm. in ant. vag. wall just behind meatus, communicating with floor of urethra.	1 year.		Redundant tissue cut away and wound closed by sutures.		Cured.

Reported by	Age.	Married or Single.	Chief Symptoms.	Duration.	Cause.	Operation.	Complications.	Res...
Giraud.	45	M.	Pain in "lower abdomen," especially during coition or when standing. Hard, reddish tumor, size of hen's egg, in vaginal vault. On pressure, foreign bodies felt in its interior. Communicated with floor of urethra.	10 months.	Had been kicked in perineal region 14 months before.	Urethra dilated and calculi removed.		Cured.
Hey (1786).			Irreg. purulent discharge from vagina. Roundish tumor at ext. os uteri. Pressure on tumor caused escape of pus from urethra. Urine clear.	15 years.		Sac longitudinally incised and packed with lint.		Cured.
Hermann.	47	M.	Painful micturition and coition. Tender swelling in ant. vag. vault, which communicated with urethra and contained pus.	3 years.		Dilatation of urethra. Appl. of $AgNO_2$ (stick).		Cured.
Heyder (1889).	31	M.	Pain in urethra. Painful micturition. Involuntary escape of small quantities of urine.	Several months.	Occurred after a difficult labor.	Sac excised.	None.	Cured.
Jones, H.			Painful micturition. Tumor size of hazelnut in ant. vag. vault. Slight discharge of pus from urethra.					Spontaneous recovery.
Keith, S.	44	M.	Frequent micturition. Bulging of ant. vag. wall. Pressure on same caused escape of pus from urethra.			Sac was incised and urethra and vaginal mucous membranes united to each other to insure drainage.		Wound closed : 4 ......
Kelly, H. A. (1894).	31	M.	Painful coition. Painful and frequent micturition. Swelling 3x2.5 cm. in vaginal vault just behind urethral orifice and communicating with floor of urethra. Contained thin pus. Only moderate number of polynuclear leucocytes.	4 years.		1. Elliptical incision over tumor. 2. Tumor dissected out to its connection with urethra and removed. 3. Wound closed by 10 silk sutures.		Stitches removed in 10 days. Union complete.
Lannelongue.	11	S.	Small tumor in vault of vagina. Some involuntary discharge of urine.			Several linear scars made over sac with thermocautery to diminish sac.		Unsuccessful.
Newman.	35		Tenesmus. Slight incontinence of urine. Small tumor in vaginal vault, which communicated with urethra.			Dilatation of urethra and irrigation.		Reported well in ......
Piedpremier.	55	M.	Painful coition. Slight involuntary discharge of urine. Tumor in vaginal vault size of "nut." Slight discharge of pus from urethra on pressure over sac.			Tumor incised per vaginam and rubber tube introduced.		Cured.
Priestley.* Priestley.*								......
Routh.	33	M.	Painful micturition. Tumor size of marble in vaginal vault, communicating with floor of urethra.			Sac dissected out and wound closed by sutures.		Wound ...... Cured.
Routh.	60	M.	Painful micturition. Sac size of walnut in vaginal vault. Contained thin offensive pus and had two openings into urethra.			Sac excised and wound closed.		...... remained in lower angle of wound. Cured.
Routh.	27	M.	Tender swelling in vaginal vault. Pressure caused discharge of irritating fluid from urethra.	1 month.		Portion of sac removed and		Wound ...... in 20 days. Cured.

* No details given.

Reported by	Age.	Married or Single.	Chief Symptoms.	Duration.	Cause.	Operation.	Complications.	Result.
Sav........		M.	Painful micturition. Pruritus and fulness in ant. vag. vault. Pressure over ant. vag. vault caused escape of contents into bladder.	12 years.	Birth of child.	Removal of elliptical piece of sac wall.	Sloughing of part of sac wall.	Cured. Died 5 years later of nephritis.
Spu.......	44	M.	Involuntary passage of urine on excessive exercise. Tumor size of hen's egg in vaginal vault.			Several veins ligated. Sac cauterized with zinc.		Cured.
Skene.			Sac in urethro-vag.-septum communicating with urethra.					
Tait (1875).			Sac size of hen's egg in vault of vagina. Pressure caused escape of ammoniacal urine from urethra.			Sac cut away and wound closed by sutures.		
Tait. Tait. Tait.	23 52 32		Swelling in vaginal vault. Painful micturition followed by escape of pus from urethra. All communicated with floor of urethra.			Sacs dissected out and wounds closed with silver wire.		All left hospital cured within 20 days.
Thomas			Frequent and painful micturition. Tumor size of hen's egg in vaginal vault. Pressure over tumor caused escape of pus from urethra.			Dilated portion of urethra cut away and wound closed.		
Winckel.			Tumor the size of a walnut in vaginal vault. Pressure caused discharge of pus from urethra.			Patient cured herself by repeatedly emptying the sac and then applying lead-water poultices.		

A CASE OF DOUBLE VAGINA, WITH OPERATION.

By HUNTER ROBB, M. D., *Associate in Gynæcology.*

The history of the case which I wish to report to-night is briefly as follows: L. H., aged 20. Family history good. Has been married for 3 years. Nulliparous. Her catamenia first appeared at the age of 14; it was regular and usually lasted 3 days, the flow being free and unaccompanied by pain. The last menstrual period occurred three weeks before she applied to us at the dispensary. There has never been much leucorrhœal discharge. Her bowels had always been regular. She had not suffered from any urinary disturbance. Beyond this her personal history was negative. The patient came to us complaining from dyspareunia and of severe backache with bearing-down pains, and at times of a burning sensation during urination. Her general condition was good, but it was noted that the thumbs on both hands were found to be curiously undeveloped, being rather short, so that she is scarcely able to make the tips of the thumb and of the little finger meet.

The preliminary examination was extremely unsatisfactory, the patient being so nervous that she would scarcely permit the introduction of the finger into the vagina.

At a further examination under anæsthesia the following notes were made at first: "The mucous membrane about the vaginal orifice is much congested, the urethral orifice is dilated so that the first finger can be easily introduced into the bladder. The vaginal orifice itself is narrow, making the examination difficult. The cervix points downwards and the external os is patulous. The uterus is turned forwards, is freely movable, and is slightly enlarged, its surface being somewhat roughened. The right ovary is small and freely movable. The left ovary

cannot be satisfactorily palpated either by examination made through the rectum or the vagina, but with the finger in the bladder the ovary can be easily made out and is found to be small and freely movable."

I had almost overlooked what proved to be the most interesting feature of the case, but my attention having been called to some further abnormality by a member of the class, upon re-examination I found that the examining finger could also be inserted into another opening in the vagina near the left lateral wall. This proved to be a second canal, which extended nearly the whole length of the vagina. A distinct membranous band of tissue separated it from the first. The measurements of the parts were noted as follows: From the upper border of the perinæum to the clitoris 6.5 cm., the remains of the hymeneal folds being found 1.5 cm. within the vagina. The hymen had been centrally perforated; on bringing the portions of the ruptured membrane together the vaginal orifice can be obliterated. The urethral orifice, which is easily dilated to a circumference of 25 mm., forms a depression above the upper limits of the hymeneal fold. The mucous membrane about the urethral orifice is intensely congested. Near the left side of the vaginal orifice there is an area of superficial ulceration measuring 1.5 cm. in diameter. The left lateral cavity is 6 cm. in length, the right 6.5 cm. The cervix uteri occupies the right vagina, being entirely shut off from the left vaginal cavity, which ends in a blind pouch. The pelvic measurement between the two anterior spines is 25 cm. The direct conjugate is 10 cm., and the intertrochanteric

measurement is 30 cm. There is also a marked diminution of the hip prominence. The pubic hair runs up into a point towards the umbilicus, after the male type. The vulva externally looks normal. Furrows in vestibule on either side measure 12 mm. in breadth. The escutcheon is well developed, and the breasts look normal.

The operation was performed on March 25, 1894. Upon introducing the blade of a Sims speculum into either orifice, the membrane which divided the two cavities could be easily demonstrated along its whole length. One finger of the left hand was passed along either side of the septum, which was then separated with scissors from without inwards as far as the cervix uteri. The uterine sound was next introduced through the cervix to determine whether or not a septum existed also in the uterus or the cervix, but none was found. The length of the uterine cavity was 7 cm. The vagina was then thoroughly irrigated with normal salt solution and 10 per cent. iodoformized gauze introduced. The patient made an uninterrupted recovery, leaving the hospital in five days, and has since returned to the dispensary saying that she feels well in every respect, the dispareunia of which she complained being entirely removed.

In this case it is worthy of note that the urethral canal was used for sexual intercourse.

These congenital anomalies of the genitalia are always interesting, and this one deviates somewhat from the form of double vagina usually met with. It will be remembered that, embryologically considered, the uterus and vagina result from the approximation and coalescence of the second and third portions respectively of the Müllerian ducts. Should for any reason the septum fail to disappear, i. e. if coalescence be incomplete, a double uterus or a double vagina or both result, and the double vagina most frequently met with is undoubtedly to be accounted for in this way. But another possibility has to be considered. The third portion of the Wolffian duct (ducts of the mesonephros) runs down on the lateral wall of the vagina and sometimes persists. This duct, commonly known in this region as Gartner's duct, is occasionally patulous; it sometimes opens into the vagina, and may be dilated into cysts of smaller or larger size (vaginal cysts in women and cows). The lateral disposition of the smaller of the two vaginal canals in our case, and the fact that it terminated in a blind sac and was not connected at all with the uterus, might be adduced as evidence of its origin from the Wolffian duct, but on account of its size we are rather inclined to accept the view that the case represents a somewhat unusual double vagina from noncoalescence of the lower third portions of the Müllerian ducts.

PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS HOSPITAL MEDICAL SOCIETY.

Meeting of February 19, 1894.

DR. KELLY in the Chair.

Exhibition of Placenta Velamentosa.—DR. CULLEN.

This specimen is a placenta obtained from a case of twin pregnancy. There were two placentæ and two separate sets of membranes. The first set was perfectly normal. In the second the insertion of the cord is rather unusual ; instead of being inserted in the center of placenta, the cord ends in the membranes about ten centimeters from the placenta, and the blood-vessels run out in the membranes to the placenta. Here we see two arteries, and a large vein which bifurcates about six centimeters before reaching the placenta. Both arteries cross over the vein before insertion. On one side the membranes are inserted about three centimeters from the margin of the placenta. Dr. Kelly thinks that the first placenta overlapped the one here exhibited, and thus prevented the membranes from reaching the margin, as is usual. Hyrtl in his Atlas gives a very fine picture of a similar placenta. This he calls "placenta velamentosa."

The Methods employed in securing Statistical Tables for Emmet's Gynecology. Exhibition of Original Tables presented by Dr. Emmet.—DR. KELLY.

I have been greatly interested in looking over the painstaking work by Dr. Emmet preliminary to the preparation of his book on gynecology.

Dr. Emmet occupies a very unique position in the history of gynecology in this country—a position which will grow more and more important as gynecology develops and closer study is given to its history. There has been a tendency, and not without good reason, to give too great prominence to the name of Marion Sims in everything pertaining to the establishment and advancement of original gynecological research in the United States. The striking originality of his methods has largely overshadowed the efficient work of other men, especially that of Dr. T. A. Emmet.

Sims' surgery was brilliant, highly originative, and calculated to impress all who visited his clinics and saw him operate. He took up a series of operations, notably that of vesico-vaginal fistula, at a time when the operative treatment was most unsatisfactory. It is a mistake, however, to give Sims the entire credit of the discovery of the operation for vesico-vaginal fistula, as many had carefully studied this subject before and contemporary with him. Among these the able work of Dr. Jobert De Lamballe, of Paris, was especially notable, and if the mortality following his operations had not been greatly increased by diphtheritic infection of the wounded surface he would undoubtedly have presented a larger percentage of successful results than did Sims.

The character of Sims' work was on the whole erratic and spasmodic. Of the enormous number of operations performed by him in the Woman's Hospital, New York, no satisfactory records exist, and for this reason we have only a general and often an unsatisfactory knowledge of his methods.

Dr. Emmet, following in the footsteps of Sims at the Woman's Hospital, promptly instituted methods of precision in recording operations and histories of cases. His notes were elaborate, scientific and painstaking, and the book which he afterwards compiled from these records is eminently a scientific work prepared by a man pursuing scientific methods. The amount of labor put forth in the preparation of the book is, I think, unexampled in the entire literature of gynecology.

It is often said that Dr. Harris, of Philadelphia, is the greatest living medical statistician : he is a relentless investigator, and will search for months . . . . to associate Dr. Emmet with Dr. Harris in this respect, as his painstaking work is seen in the statistical tables, only a few of which appear in his book.

Although it may strike you that there is much in these tables which is to-day useless, you must remember that when they were compiled, gynecology was in a nascent state, and it was impossible to determine the relative value of the varied information collected by Dr. Emmet, and consequently he classified the entire subject. It gives me pleasure to exhibit three of these tables to the Society. I read you the accompanying letter :

<div style="text-align:right">
" 89 MADISON AVE., N w YORK,
December 21, 1893.
</div>

DEAR DR. KELLY:

As soon as I opened my private hospital in 1861 I began to keep a careful record of the patients as to their history previous to admission. Unfortunately I soon became too busy a man to keep the records with any regularity as to the subsequent treatment. I treated over twenty-five hundred patients in my private hospital during some eighteen years, and up to the time when I began to prepare the tables for writing my book on Gynecology. At an early day I settled upon the plan which I have given in my book as an outline for recording the history of a case.

I wished to get at the natural history of diseases if possible, and felt from the beginning that it would prove good work, as I had a class of patients who could answer intelligently any question asked, and if unable to do so accurately the individual so stated and I noted the fact. I do not know of any other statistics of the kind which have been drawn entirely from educated people, thus giving the truth and nothing but the truth.

When I began making these tables for my book I h d no theory to prove, and during some two years every spare moment of my time was occupied in placing each detail in the history of these cases under some appropriate head. In other words, my work was not unlike seeking for the channel in an unknown harbor where, after making soundings at regular distances over the whole surface and after dotting these down as made, the course of the channel then became distinctly marked out.

I made over one hundred tables, and many of them were far more elaborate than those I gave you. Each of them was split up into smaller ones to bring out special points, of which a number are given in my book on Gynecology ; but a great number were never used, as I could not judge of the value until each had been boiled down, as it were, and then I might find the result prove unimportant. You remark that I have developed a wonderful memory for details, and it is true, for I find it a very rare circumstance that I am not ble to recall the chief features of a case if I have ever recorded the history, or if I have ever made a dr ying in connection with it.

This has proved a very important aid to me throughout my professional life, as my memory is constantly presenting some typical case in past experience. The impression made upon my brain by a digital examination is no less remarkable, as every vagina seems to have its own individual features even better marked than those of a woman's face, which I often forget, while a subsequent examination with my finger will generally recall to my mind that I have at some time seen the case before.

The statistics which I have given in my book are so accurate in every detail that I believe in years to come they will be studied more and more as the fact become recognized, and in the future may prove the means of preserving the work as an authority after the author has been forgotten.

<div style="text-align:center">Yours sincerely,</div>

[Signed]   THOS. ADDIS. EMMET."

Report of Ophthalmological Cases. An Unusual Anomaly of the Crystalline Lens. Coloboma Lentis. – DR. THEOBALD.

This case is one which has been denominated, and I think correctly, coloboma of the lens. It is the only case that I have met with which I was disposed to regard as of this nature. The patient was seen a short time ago at the Baltimore Eye and Ear and Throat Hospital. She is a mulatto girl, 18 years of age, and has been employed as a nurse. There is nothing remarkable about her general condition, and one eye is practically normal. In the other eye (the left) I found a slight opacity of the lens and a very high grade of myopia. Upon dilating the pupil, I discovered this interesting condition of the lens: There was a crescentic notch at the lower border of the lens, through which the fundus of the eye could be seen, the choroid appearing of a deeper red than when viewed through the lens. There were also several limited areas of opacity in the anterior cortex of the lens. The sight of this eye was very defective, Jaeger No. 16 being read with difficulty. In this connection I may mention a very similar case which I saw some years ago, and which I reported to the American Ophthalmological Society.* In that case there was a crescentic notch in the lens almost exactly like the one in the present case. It was to the *outer* side of the lens, however, and right in line with it was a corneal scar and an anterior synechia. I regarded the lens defect in that case, not as a congenital coloboma but as a result of a wound of the lens margin. Although there was no history of a wound, it seemed to me that some sharp body, such as a pin or needle, had penetrated the cornea, iris and lens, producing the corneal scar and the anterior synechia, since just in line with these two evidences of traumatism was the little notch in the periphery of the lens. There was also a little cortical opacity about the edge of the notch. The case was discussed by several members, Dr. Kipp and Dr. Knapp among others, and they were both inclined to think that it was of congenital origin. The situation of the notch, however, seems to confirm the view which I took that it was traumatic and not congenital.

Coloboma of the lens is an extremely rare condition. I have looked over all the more recent works upon the eye which are within my reach, and I find it treated of in only one of them, De Schweinitz's recently published Diseases of the Eye. Fuchs makes but the briefest reference to it, and Noyes does not mention the subject at all. A pamphlet published by Dr. A. G. Heyl of Philadelphia, and which is referred to in de Schweinitz's book, brings together more of the literature up to the time it was published than is to be found anywhere else. This paper was read before the Fifth International Ophthalmological Congress, held in New York in 1876. In this pamphlet the author states that he has gone over the literature of the subject and has found only 18 cases, and these were chiefly reported by European observers. He speaks of it as a clinical curiosity. Coloboma of the lens is said to be frequently associated with coloboma of the iris and of the choroid, but in the cases mentioned in Heyl's paper there were a number in which there was no other congenital defect found except that in the lens. Heyl states that it is often associated with a high grade of myopia, and that lens opacities are frequently present. Both of these conditions we find in my case. He points out, too, that the coloboma *always* occurs in the lower part of the lens.† It may involve a portion of the upper part, but it never occurs entirely in the upper portion. The shape of it varies. Sometimes it is as though a portion of the periphery of the lens had been planed off, but oftener, as in this case, it is a notch with its convex aspect above. The size varies very greatly ; as much as one-third of the lens has been known to be involved. The question of etiology is of great interest, but very little light has yet been thrown upon it. Of course it cannot be explained in the same way as coloboma of the iris and of the choroid. This we can explain by the failure of the cleft in the

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* Trans. American Ophthalmological Society, Vol. III, Part 3, 1882.

† In an interesting paper upon Coloboma Lentis, by Dr. W. B. Marple, which has appeared in the New York Eye and Ear Infirmary Reports, January, 1894; since the report of my case was made to the Society, reference is made to two cases in which the coloboma was situated in the upper portion of the lens. He describes a case (in which the coloboma was in the usual downward direction) that he has recently met with, and asserts that up to the present time not more than seventeen or eighteen cases of coloboma lentis have been reported, though other cases have probably been observed.

lower part of the tunics of the eye to close, but the embryology of the lens is quite different; it is formed from the ectoderm, whereas the choroid and iris are formed from the mesoderm, and from the secondary optic vesicle, and in an entirely different way. The only suggestion as to etiology I have found is in this article of Dr. Heyl's. It is this: The nutrition of the lens in the embryonic development of the eye depends chiefly upon the hyaloid artery, which passes forward from the optic disc to the posterior pole of the lens. Having reached the posterior pole of the lens, it divides into fine branches, which distribute themselves over the posterior portion of the lens, and finally reach the periphery of the lens and pass forward over its anterior surface. At that point they are joined by numbers of small vessels from the iris. This vascular supply first reaches the posterior pole of the lens, and there the building activity is much greater; later on, as the vessels reach the periphery of the lens, the growth there becomes active. Of course these processes go on in a measure together, but the peripheral portion of the lens is later in forming than the central portion. Now, Heyl's theory is that some of the peripheral branches of the hyaloid artery fail to develop, and therefore the lens at this point, not having its blood supply to afford it nourishment, is built up in an imperfect manner. This theory seems plausible, but it fails to account for the fact that the colobomata are always found in the lower portion of the lens.

A Case of Glaucoma of Exceptional Character.—DR. THEOBALD.

One of the characteristic features of almost all cases of glaucoma is dilatation of the pupil. This is not so universally the case in simple glaucoma, but in inflammatory glaucoma it is almost invariably one of the characteristic symptoms, and this is especially the case in the advanced stage of inflammatory glaucoma, when the condition known as *glaucoma absolutum* has developed, and vision is entirely destroyed. I cannot recall having, heretofore, met with a case of this character in which there was not very decided dilatation of the pupil. There are several factors in the explanation of the dilatation of the pupil. In the first place, with the increased tension there is compression of the branches of the ciliary nerves which go to the sphincter muscle of the iris, with resulting paresis of the sphincter and consequent mydriasis. This is, perhaps, the first factor that brings about the enlargement of the pupil. Then as the disease runs its further course there occurs an atrophy of the iris tissue. This, of course, involves the muscle tissue of the sphincter, and dilatation becomes more marked. The case which I wish to bring to the attention of the Society owes its interest to the fact that this characteristic symptom of dilatation of the pupil was entirely absent. It is a case of inflammatory glaucoma, involving both eyes, which, through the neglect of the patient, had, when it recently came under my observation, reached the stage of *glaucoma absolutum*. I had seen the patient months before and had urged operation, as others had done, but she had refused to give her consent, and in consequence vision was entirely destroyed. When she came to the Johns Hopkins Hospital she had every evidence of advanced inflammatory glaucoma, except that her pupils were not in the least dilated. There was high tension, the media were steamy, vision destroyed in both eyes, marked subconjunctival injection, anterior chambers shallow; indeed every feature characteristic of glaucoma was present, except that the pupils, as I have said, were quite of the normal average size. The case, for this reason, is one certainly worthy of being placed upon record. The patient is a mulatto woman 60 years of age, engaged in housework. When she came to the hospital she was suffering intense pain. I operated for the relief of the pain, doing an iridectomy on each eye. She has been relieved of her suffering, but she remains, of course, absolutely blind. I should add that there were no synechiæ present, to prevent dilatation of the pupils, and no evidence of former iritis or of other disease than the glaucoma.

Ligation of both Internal Iliac Arteries for Hemorrhage in Hysterectomy for Carcinoma Uteri.—DR. KELLY.

I bring before you this evening an exceedingly interesting case from several standpoints, one of which is novel and I think suggestive.

The history of the case is briefly as follows: S. W., aged 37 years, married, admitted to hospital, October 7, 1893. Two para, younger child 13 years of age; labors slow and protracted, each terminated by forceps. Menses established in her thirteenth year, regular, normal in amount, lasting one week.

In September, 1893, flow became more profuse and clotted, and later did not cease between periods. For one year before menstrual derangement was observed the patient had been subject to a constant, ill-smelling leucorrhœal discharge.

Family history.—Patient knows of no one in her family who has been affected with carcinoma.

Status præsens.—The essential points in her present condition are: constant flooding, labor-like pains with the expulsion of large clots, anorexia, progressive secondary anæmia, nausea and vomiting, and sharp pains in back and lower abdomen.

Vaginal examination.—Outlet greatly relaxed as a result of difficult labors; cervix very much enlarged, filling vaginal vault, infiltrated and hard. Infiltration extends down 2 cm. on the anterior wall, posterior wall not affected. Infiltration of both broad ligaments; mobility of uterus somewhat limited, much more on right than on left side.

Diagnosis.—Carcinoma cervicis uteri extending laterally into both broad ligaments.

One of the essential points in a vaginal hysterectomy is to catch the cervix and draw it down with tractors as the broad ligaments are tied off. In this case the infiltration of the cervix was so extensive that there was no healthy, firm tissue through which to pass the traction sutures. For this reason I determined to resort to abdominal hysterectomy after having first freed the uterus from its vaginal attachments by ringing the cervix and stripping it up in the manner adopted in vaginal hysterectomy.

Upon opening the abdomen I found that the broad ligaments, especially the right, were much more infiltrated than I had anticipated.

I ligated the ovarian arteries at the pelvic brim and then began tying off the broad ligaments. The tissues were extensively infiltrated and so friable that the ligatures cut out the moment traction was put upon them. The hemorrhage was profuse and attempts to check its immediate sources were futile. As the patient was already excessively anæmic from previous hemorrhage, I determined upon the boldest procedure possible for checking the bleeding—that of entirely cutting off all pelvic circulation by the ligation of the internal iliac arteries. Accordingly the peritoneum over the arteries was incised, first on the right and then on the left side, and the arteries ligated by passing stout ligatures by means of the curved aneurism needle.

This checked all hemorrhage and I was able to proceed with the operation. I soon found, however, that I had another almost insuperable difficulty to deal with, as the left ureter was imbedded in and intimately associated with the carcinomatous mass. Above the point of its entrance into this mass there was a marked hydro-ureter due to the compression below. By careful dissection I freed the ureter and displaced it to one side, and continued the enucleation down towards the point of incision in the vagina.

At this stage of the operation the vital forces of the patient began to fail rapidly, the pulse increasing to 160 and the respiration becoming shallow. While I proceeded with the operation Dr. Clark transfused into the radial artery towards the heart a half litre of normal salt solution, which was promptly followed by

marked improvement in the patient's condition. Her pulse dropped rapidly from 160 to 140 and then to 120 and became full in volume.

It was perfectly evident at the completion of the operation that there was still extensive infiltration of the broad ligaments which could not be removed.

The patient made a slow but satisfactory recovery and was discharged from the hospital, November 23, 1893. Within the past week she was readmitted to the hospital for the purpose of having a vesico-vaginal fistula operated upon which was made accidentally during her previous operation.

Strange to say, after the most careful examination by rectum, vagina and abdomen I was unable to find the slightest trace of the carcinomatous process. We are keeping this patient under the closest observation to see if the carcinomatous growth has really disappeared.

The special points of interest in this case are (1) the prompt benefit derived from transfusion, and (2) the apparent cure of the carcinoma by cutting off its main blood supply.

Exhibition of Cases: Mother with Coloboma of Iris. Two Children with an Aniridia.—Dr. Theobald.

The cases I wish to present are quite rare. The case of the mother is not quite unique, but perhaps not far from it. The mother has a large coloboma of the right eye upwards. The unusual feature is the upward position. In the left eye there is a small coloboma which is upwards and slightly outwards. There is no coloboma of the choroid, which is very often present in conjunction with coloboma of the iris. The shape of the coloboma, besides, is rather unusual. Colobomata are generally pyriform, with the apex towards the periphery of the iris, but in this instance it is more like the ordinary keyhole coloboma which one makes in operation for artificial pupil. I reported these cases to the American Ophthalmological Society some six years ago. The upward position of the coloboma gave rise to considerable comment from its unusual character, and Dr. Randall, of Philadelphia, made the statement that he had just been working up the subject and that he had not been able to find a single instance of coloboma of the iris directed upwards. Fuchs asserts that "congenital coloboma of the iris is always situated below," but follows it on the next page with the statement that he had recently met with a case of coloboma of the iris which was directed upwards.

It is of much interest that the mother, having this unusual form of coloboma iridis, should have given birth to two children with complete aniridia, that is, absence of the irides. There is no trace of the iris present in the eyes of either of the children. The girl is nine years of age, the boy is seven years old. The girl has a low grade of choroido-retinitis, and there is a very interesting form of opacity in the lens of each of her eyes, chiefly at the posterior pole. The opacity follows the septa of the lens, showing the divisions, which are very complicated in the human lens. This is true, in a measure, of the boy. Another feature, well marked in the girl, is a peripheral opacity of the cornea. This is spoken of by the authorities as being one of the conditions not infrequently met with in aniridia. Besides a little diffuse opacity of each cornea there is a fringe-like opacity around the corneal limbus, suggesting the appearance of the arcus senilis, but less dense and having a ragged edge. Vision is poor in both of these children. The girl has in one eye 20-200 vision, in the other 15-200. By holding the type close, she can make out Jaeger No. 1. The condition of the boy closely

resembles that of his sister, but he has no corneal opacity, and especially none of the peripheric opacity. He has what the little girl has not—very pale optic discs, showing some atrophy of the optic nerves. His vision in one eye is 18-200, and 20-200 in the other. He is not able to read as small print as his sister. He can read Jaeger No. 4 with the left, and Jaeger No. 2 with the right eye. He has marked nystagmus and a considerable amount of hypermetropia. He has less post-polar lens opacity than the girl, but has some cortical opacity in the periphery of the lens. He had a convergent squint of the left eye, for which, in 1887, I performed a tenotomy, which seems to have fairly well corrected the defect.

A few words as to the special significance of these cases. They have an interesting bearing on the etiology of coloboma of the iris. In order to make this plain, we will have to say a word or two in regard to the embryology of the eye. The first step in the development of the eye consists of a lateral outgrowth, from the inferior portion of the fore-brain, of what is known as the primitive optic vesicle. After a short time the proximal portion of this evagination becomes constricted to a pedicle. This pedicle becomes the optic nerve. The primitive optic vesicle grows out until it finally comes in contact with the ectoderm. As soon as this takes place the ectoderm at this point becomes thickened, and following this thickening an invagination of the ectoderm occurs. In a short time this invagination is closed over, and from this invaginated portion of the ectoderm the crystalline lens is formed. At the same time that this is taking place the primitive optic vesicle changes its shape and becomes itself invaginated and gradually encircles the lens. This is called the secondary optic vesicle. The cavity of the primitive optic vesicle through this process of invagination is obliterated. The walls of the secondary optic vesicle, as is evident from the method of their formation, are composed of two layers. The distal layer goes to form the retina, and the proximal layer forms the uveal coat of the choroid. The lens has now developed more completely. Some mesodermal cells are caught between the outer coat of the ectoderm and the lens, and these form the cornea proper and part of the iris. The iris develops later, partly from the edges of the secondary optic vesicle and partly from these mesodermal cells. The different portions of the primitive optic vesicle do not all grow toward the ectoderm with the same rapidity; the upper portion grows more rapidly, and the invagination, to form the secondary optic vesicle, begins first at this point. Thus it happens that the upper part of the secondary optic vesicle forms a sort of hood above and at the sides of the lens, while below there is a gap, the choroid fissure. The failure of this gap to close is the usual cause of coloboma of the choroid and of the iris, and hence it is that such colobomata are almost without exception directed downwards. The iris does not generally form, in the normal condition, until after this gap or fissure is closed. Sometimes we have coloboma of the choroid, without coloboma of the iris, and vice versa.

The situation of the coloboma in the case of the mother shows that, in exceptional instances, we may have coloboma of the iris which is entirely independent of this failure to close of the choroidal fissure. The explanation would seem to be that the iris tissue failed to develop from the anterior lip of the secondary optic vesicle at the point represented by the coloboma. Now if we exaggerate this condition, we can understand what has happened in the two children; with them the outgrowth of the iris has failed, not simply over a limited area, as in the mother, but throughout the whole circumference of the margin of the optic vesicle.

NOTES ON NEW BOOKS.

Nursing: its Principles and Practice. For Hospital and Private Use. By ISABEL ADAMS HAMPTON, Principal of the Training School for Nurses, Johns Hopkins Hospital. (*Philadelphia: W. B. Saunders.* 484 pp. 8vo.)

With the development of nursing as an art, or, if the term be preferred, a profession, which has taken place within the last twenty-five years, the older manuals and text-books on the subject have to a great extent become as obsolete as are the text-books on the practice of medicine and surgery which were favorites in 1865. A trained nurse possessing a diploma or certificate of graduation from a first-class school is now expected by physicians to know many things and to be able to do many things without special instruction from him which formerly he would have considered himself solely responsible for. Miss Hampton's book, giving as it does an outline of the plan of organization and many details of the methods employed in the training school and the nursing work in the various departments of the Johns Hopkins Hospital, is therefore interesting to physicians as well as to nurses, as indicating what a trained nurse of the present day may be expected to know and to be able to do.

Some of the older manuals on nursing appear to have been prepared with the idea that the nurse would possess no other book beside the manual aforesaid, and therefore included details of anatomy, of bandaging, of receipts for food, etc., all of which it is satisfactory to see are omitted from this new work. By the way, some competent person ought to write a book on human anatomy for the use of nurses, in which there should be, among other things, a special chapter on the topographico-anatomical peculiarities of babies. The first chapter is devoted to the general subject of training school organization and management, giving a detailed scheme of studies for thirty-six teaching weeks from October 1st to June 1st and for each year of a two years' course.

In the next edition we should like to see in this chapter some instructions as to the selection of the probationers who are to be admitted, what the physical and mental qualifications are which are to be required of candidates, and what should be the character of the examination to determine these. It is clear that Miss Hampton has a high standard for the qualifications requisite for graduation as a nurse, and her standard for admission must therefore be high.

A glance at the vocabularies at the end of the book shows that technical terms are used freely in the course of instruction, although the lists do not include quite all such terms found in the book, as for example "prodromal." Probably these vocabularies would be a little more convenient for use if combined in a single alphabetical order.

The instructions given in the many details of a nurse's work are clear and concise and up to date. As good examples may be noted those relating to hypodermic injections, to baths, and to observing and recording the symptoms of a case. The section on "hospital etiquette" is very good reading, but only an hospital official of some experience can fully appreciate it.

It is to be hoped that this book will have a wide circulation, not only among nurses but among physicians.   J. S. B.

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BULLETIN

OF

THE JOHNS HOPKINS HOSPITAL.

CONTENTS.

NOTES ON PARASITES.

By Chas. Wardell Stiles, Ph. D.

26: DISTOMA (MESOGONIMUS) WESTERMANNI. DISCOVERY OF A PARASITE OF MAN, NEW TO THE UNITED STATES.

[Read before the Johns Hopkins Hospital Medical Society, April 16, 1894.]

Dr. H. B. Ward,* formerly of Ann Arbor, Mich., now Professor of Zoölogy in the University of Nebraska, has recently made an important discovery which should immediately be brought to the attention of the medical and scientific professions of this country, as it shows that we have in the United States a fluke which is more or less common in Man in eastern Asia, but which, up to Ward's investigations, had not been noticed in America.

Some months ago the lungs of a cat were referred to Ward for examination, and in them he discovered some encysted flukes which, after careful study, proved to be *Distoma Westermanni.*

This parasite was found in a Japanese by Bälz in 1878, who, however, did not recognize its true nature, but believing that the eggs which he found in the sputa were protozoa, named (1880) the structures *Gregarina pulmonalis s. fusca.* Manson also found the eggs of this species in Amoy, and afterwards obtained a specimen of the worm which Ringer had found in Formosa. Cobbold then obtained this specimen and described it as *D. Ringeri.* The parasite was afterwards studied by several authors, notably by Leuckart, who discov-

ered to his astonishment that the form was identical with one which Kerbert had found in the lungs of a tiger (*Felis tigris*) in Amsterdam.

Now that Ward has found this same form in a cat in America, it may be well to give a short zoölogical description of the worm, with synonymy, etc., at this time, in order to place American physicians on their guard for its possible occurrence in the lungs of their patients.

Most zoölogists classify the worm in the genus *Distoma,* but Monticelli (1888) has created a new genus *Mesogonimus,* in which it must be placed should this genus prove to be well established—a point upon which helminthologists are not yet agreed. The genus *Mesogonimus* is based upon the position of the genital pore, which is *posterior* to and near the acetabulum. The synonymy, specific diagnosis and bibliography of the worm in question are as follows :

Distoma (Mesogonimus) Westermanni.

1878.   *Distoma Westermanni,* Kerbert.

1880.   *Gregarina pulmonalis s. fusca,* Bälz.

1880.   *Distoma Ringeri,* Cobbold.

1881.   *Distoma pulmonis,* K., S. and Y.

1883.   *Distoma pulmonale,* Bälz.

1890.   *Mesogonimus Westermanni,* Rail.

* Ueber das Vorkommen von *Distoma Westermanni* in den Vereinigten Staaten ; C. f. B. u. P., XV, 10-11, pp. 362-4, 1894.

Length, > 10 mm.; breadth, 4–6 mm.; body thick, plump, reddish-brown (fresh) to slate (preserved) in color; oval to elongate in form, transverse section generally round, rounded anteriorly, somewhat attenuated posteriorly; oral sucker small (0.75 mm.), subterminal; ventral acetabulum slightly larger and situated slightly anterior to the middle of the body; cuticle covered with broad scale-like spines; genital pore immediately posterior to acetabulum near the median line; œsophagus very short, so that the bifurcation of the intestine is considerably anterior to acetabulum; intestinal cæca run irregularly some distance from each other to the posterior extremity. *Male organs:* Cirrus and cirrus-pouch absent; ductus ejaculatorius straight; testicles tubular, ramified, nearly symmetrically situated in the posterior portion of body. *Female organs:* Ovary branched, lateral, somewhat posterior to acetabulum; on the opposite side of the median line, at about the same height, is situated a lobate shell-gland and a rather short, massed uterus, the folds of which extend ventrally of the shell-gland; vitellogene glands lateral, well developed, extending from the anterior to the posterior extremity; vitelline reservoir large; Laurer's canal present; eggs oval, 0.08–0.1 mm. long by 0.05 broad, yellow and with a thin shell. Miracidium ciliated, develops after eggs escape from their host. Sporocyst, redia and cercaria not known.

For details of pathology, symptoms, etc., the reader must be referred to the special literature on the subject (see especially Yamagiwa, 1892); but the following brief summary, taken from Railliet's new Traité de Zoologie Médicale et Agricole (1893–4), may be interesting to those who have not access to these works.

"This worm is found in the small bronchi or in cysts situated at their periphery. The cysts in question attain the size of a hazel-nut; they contain a reddish material formed of mucus, blood-corpuscles, débris of lung-tissue, and the distomes. Their wall is indurated, and they communicate with the bronchi only through small orifices by means of which the eggs escape.

"Individuals infested with these parasites show certain symptoms which may be summarized as follows: Cough light or absent; sputa of a rusty or slightly yellowish color, owing to the presence of the brown eggs; occasionally hemorrhages, which continue irregularly during several years. This affection, known as 'parasitic hæmoptysis' or simply 'pulmonary distomatosis,' seems to be quite common, especially in Formosa, where 15 per cent. of the population are affected with it, and in Japan. It does not appear to be incurable, and seems to be serious only in exceptional cases."

A microscopic examination of the sputa will reveal the presence of the fluke-eggs and thus give a positive diagnosis.

The two specimens which I here exhibit to the Society are some which Dr. Ward forwarded to me some time ago in order that I might confirm his specific determination.

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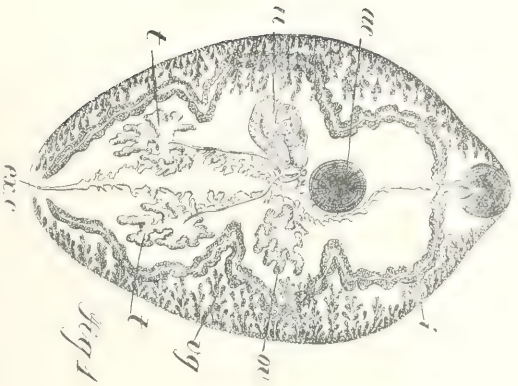
Distoma (Mesogonimus) Westermanni.

FIG. 1.—Ventral view, after Leuckart, '79-94, Fig. 182. *c,* intestinal cæca ; *ov,* ovary ; *og,* vitellogene glands ; *t,* testicle ; *ex.v,* excretory system : *u,* uterus ; *ac,* acetabulum.

FIG. 2.—Dorsal view, after Leuckart, '79-94, Fig. 186.

FIG. 3.—Twice natural size, original from one of Ward's specimens.

FIG. 4.—Egg containing ciliated miracidium, after Nakahama, from Leuckart, Fig. 190.

MADAME BOIVIN.

By Hunter Robb, M. D., *Associate in Gynæcology.*

Marie Anne Victoire Boivin, the famous midwife, was born in 1773 and died in 1847. Although her early education was not very complete, she must have made up for any deficiencies later on, for she was not only a voluminous writer, but her writings show a careful study of the subjects taken in hand. She was in the Maternité, in Paris, from 1797 to 1811, where among others she had for her instructors Lachapelle and Chaussier.

In her work entitled " Memorial de l'art des accouchements," first published in 1812, and which had reached its third edition in 1824, she expounds the methods which were in use in the Maternité. The book, however, aroused the jealousy of Lachapelle, who compelled Boivin to give up her position. But by this time Boivin had attained to some celebrity, and she found a congenial field of work in the hospital of Poissy and the Maison de Santé, during which time she found leisure to translate some of the English writings upon gynæcology, and to write a monograph on "Hemorrhages of the Uterus," which was awarded a prize.

Later on she published papers on "The Vesicular Mole," on Abortion, on the Measurement of the Pelvis, and upon Cæsarean Section. Associated with Dugès, a nephew of Lachapelle, she was the author of a work in two volumes entitled : "Traité pratique des maladies de l'uterus et de ses annexes." This work was published in Paris in 1833, and was afterwards translated into English by G. O. Hemming, who was consulting obstetrician to the St. Pancras Infirmary. She also appears to have written some other monographs and to have translated several works, among them a treatise by Barron on the subject of Tuberculosis.

On account of her writings she was given the honorary title of Doctor of Medicine by the University of Marburg.

Her "Memorial de l'art des accouchements" was written, as we have said, while she was at the Maternité. She began it, she says, for her own benefit, and made drawings of the different positions of the fœtus, principally for the instruction of her niece, who had the intention of becoming a midwife. Being surprised by Chaussier while engaged in this work, and being asked by him whether she would not be willing to publish it, she replied that the main difficulty lay in the great cost of reproducing the plates, and that without these she thought that such a book would be comparatively useless. Upon this Chaussier offered to take the expense upon himself, for which great liberality she expresses her gratitude in the preface to the first edition.

The second edition contains many chapters which were not in the first, notably those on the Circulation of the Blood in the Fœtus, on the Nutrition of the Fœtus, on Artificial and Natural Deliverance, on the Care of the Woman before, during and after Labor, and on the Care of the Newborn Infant.

"The precepts contained in this work are," she says, "founded on the practice of the Hospital of the Maternité and on those of the most celebrated practitioners of our own as well as of foreign countries. We have had recourse to our own experience only in those cases where more reliable authorities have been wanting."

The criticism of the General Council of the administration of the civil hospitals of Paris on the work is perhaps as good as can be found, and we therefore give a brief abstract of it. The Commissioner says : " All treatises on Midwifery are composed essentially (1) of the anatomical and physiological part necessary for the better comprehension of the development of pregnancy and the mechanism of labor; (2) of a part which explains the mechanism of natural labor, notes the different obstacles which are opposed to its course, rendering it more or less difficult, and indicates the proper means by which these are to be remedied ; (3) of a description of the conduct of labor."

"The first part is treated in this work excellently and systematically. All the parts referring to pregnancy and labor are written with great clearness and precision, as also are those treating of the development of the embryo and of the fœtus. One sees with pleasure that Madame Boivin possesses a thorough knowledge of her subject. The mechanism of labor, which is the foundation and the key of the whole art, is well described. The third part, namely that which treats of the conduct of labors, is generally taught by means of a machine, or sort of manikin, which represents the woman in labor. It is the custom to demonstrate to the pupils all the possible positions which the child can occupy with relation to the canal through which it has to pass, and these the pupils are made to practice on the manikin. The different positions and the manipulations which they demand form the most important part of her work, and it is just this which distinguishes it from the elementary books upon the art of midwifery. They are set forth in 133 plates, but after what I have just said it is easy to judge that this work ought to be more useful to those who have already finished their course than to those who are commencing it."

A footnote by the author says : " It was this last remark which determined Madame Boivin to make additions to the book, so that it might be equally useful to those who were beginning as to those who had ended their course."

We shall say very little more about the work itself. In speaking of the nourishment of the fœtus she gives some very interesting experiments of Chaussier which were made to prove that the uterine vessels communicated, although indirectly, with the umbilical vein.

In speaking of the different presentations she refers to Baudelocque's statistics, which contained 20,517 births. She also gives a table of cases reported by H. Samuel Merriman, accoucheur of the General Dispensary of Westminster, at the Middlesex Hospital, and of the Infirmary of St. George's Parish in London. This table is taken from his work which is entitled " A synopsis of the various kinds of difficult parturition." Every possible position is illustrated in the

plates at the end of the book, and there are also figures which serve to illustrate the use of the lever and of the forceps, as well as showing the other different manipulations.

The book closes with the aphorisms of Mauriceau, who was an obstetrician of the 17th century, and of those of Orazio Vallota, the latter of which she translates from the Italian. Of these we shall not speak now, as we are dealing with the original works of Boivin.

This smaller book which I now show you accompanied by a German translation, was published in Paris in 1828, and is entitled "Researches on one of the most frequent and least known causes of abortion," followed by a monograph on the pelvimeter. The work, which was commended by the Royal Society of Medicine of Bordeaux, consists of careful notes on a number of cases, some of which came to autopsy, and its purpose is to refute the opinions of those who held that "pregnancies, abortions and difficult labors are the most frequent causes of diseases of the uterus." "On the contrary," says Boivin, "it is the diseases of the uterus, and even more often those of the adnexa, which are the cause of abortion and of premature labor. (2) Among the many women whom we have seen suffering with diseases of the uterus, many confessed that they had had abortions, but very few had met with difficult labors." In an interesting footnote she adds: "At the moment of writing these pages I was consulted by the wife of a druggist, aged 23, in whom on three successive occasions labor had come on at the end of seven months. During the course of the two last pregnancies she received the intelligent aid of Professor Gardien; but in spite of this, and in spite of general blood-lettings (repeated four or five times) and absolute rest, the labor came on in the seventh month. In this case we found upon examination that the adnexa on the right side were adherent to the uterus."

This, then, is the most important proposition in the work, and we will content ourselves with a short summary of the conclusions at which she arrives. (1) Abortion is often the result of an organic lesion of the uterine adnexa, and these diseases are not, as is generally supposed, often caused by abortion. (2) Such lesions are seen more often than one would think in young patients. (3) They are generally due to a chronic phlegmasia, to irritation, or to the formation of accidental tissue which exposes the parts to an acute inflammation. (4) Such conditions are often brought about by neglect of the laws of hygiene. (5) The germs of these affections are seen in girls who are weak, of a lymphatic temperament, or of a scrofulous constitution, who are troubled with habitual constipation or diarrhœa, who have a bluish sclerotic and long eyelashes. (6) With these last menstruation is premature and seldom regular. Leucorrhœa and constipation are ordinarily the cause of these diseases, but often these causes become effects. (8) Since the symptoms of this disease can easily be mistaken for those of another affection, the rational method of diagnosing such conditions is by careful examination. (9) The examination of the genitals should be made with the greatest care, and it should be especially noted whether the organs are fixed or movable. When the uterus is bound down, if conception takes place, abortion will result. (10) Adhesions of the peritonæum to

the surface of these organs hinder them from changing their position in the normal manner. (11) Marriage, which is so often recommended for this condition, in the majority of cases instead of curing, acts as an exciting cause of diseases of the uterus. (12) When only one tube or ovary is diseased, conception can take place, and can even go on to term. (13) But abortion will almost inevitably result, if the adhesions, no matter what their nature be, are extensive, because they bind down the uterus and do not permit it to expand. (14) Such abortions are very generally followed by grave accidents, by hemorrhage, metritis, peritonitis, ulceration, sometimes even by gangrene of the parts affected, and death. (15) At other times, ulceration follows abortion, and if the abscess breaks into the peritoneal cavity, the result is fatal for the patient, but if it discharges through the vagina or rectum she may recover. (16) One cannot judge of the condition of the uterus by the appearance of the utero-vaginal orifice. (17) The disease sometimes extends to the adnexa, but on the other hand sometimes it is at first limited to them and progresses from within outwards. (18) When the ovary is diseased, but is not bound down and can extend into the abdominal cavity, it may happen in such cases that the uterus preserves its normal situation and its natural volume. Sometimes when the ovaries and tubes have increased in volume we find an atrophied uterus. (19) Fatal accidents are less common when the diseased adnexa are not bound down. We may have, however, compression of the lungs, and ascites. (20) Cyst of the ovary is only dangerous in itself when it has attained a considerable volume. The patient, however, generally succumbs to exhaustion. (21) In pregnancy the umbilicus goes towards the middle regions of the abdomen instead of descending towards the pubes, as it does in case of abdominal tumors and in ascites. (22) Many of these diseases can be prevented and many patients can be saved by an early diagnosis.

The second series of cases are instances in which diseases of the ovaries have been mistaken for pregnancy. In speaking of the operations which have been practiced for diseases of the ovaries, she takes the opportunity of translating into French a letter on a case of successful extirpation of the ovary, addressed to a citizen of Philadelphia by Alban G. Smith, M. D., of Danville in Kentucky. She follows to some extent the literature on the subject of these operations and mentions McDowell's cases, quoting from the "Eclectic Repertory." She mentions the case of Dr. Nathan Smith, which was recorded in the Edinburgh Medical and Surgical Journal, as well as four cases of M. Lizars. Quoting from a number of the same journal in 1825, she says that the English are not in favor of this operation, and credits the editor of the "Review" with the following remarks: "It is impossible to believe that such an operation has ever been performed with success, and we do not think that one should ever undertake it." For herself she says: "We are more credulous than the author of the article in the Medico-Chirurgical Review; not only do we believe that the operation has been attempted, but that it has been performed with success, because there are circumstances which accompany diseases of the ovaries which permit us to believe in a sort of cure; but since these favorable con-

ditions can never be known until after the operation has been begun, the attempt we must admit savors of rashness, and the success obtained could not guarantee a lasting security. It is true that gastrotomies, gastro-hysterotomies, and other operations where the peritonæum has been opened, have often been attended with favorable results, and accidental wounds of the abdomen have frequently gotten well, but it must be remembered that disease of the ovaries which is not caused by abnormal pregnancy is almost always the result of some constitutional affection and of a scrofulous or cancerous idiopathy. In these latter cases, therefore, the resistance of the patient is diminished." She concludes by saying that such operations might prove more successful on savages and negresses, who from suffering in a state of slavery are almost indifferent to what would be fearful pain to Europeans, who have arrived at a high condition of civilization, and are consequently much more sensitive. In the case of the latter, she doubts whether such operations will be found to succeed as well as in that of "those poor wretches who are obliged to submit to the commands of the master who orders them to be disemboweled just as he orders them to work."

In the same volume is found a description of a new pelvimeter with accompanying plates. The chief advantage claimed for her instrument is that by its use great accuracy is obtained, since one arm is inserted into the rectum and thus rests upon the sacro-vertebral articulation.

We have referred somewhat at length to this one of the less important writings of Madame Boivin, but we now come to what is perhaps her greatest book, which, as we have said before, she wrote with the assistance of A. Dugès, a nephew of Lachapelle, and which is entitled "Diseases of the Uterus and its Appendages." The very fact that the book was published as late as 1834, and was written in conjunction with a man who was a well-known writer and a professor of the faculty of medicine of Montpellier, besides possessing many other titles, would have led us to expect that we were dealing with a comparatively modern book on the subject of gynæcology, and one which was fully abreast, if not ahead, of the times in which it was written. In fact, twenty years ago it might well have passed as a modern text-book, and it is only since bacteriology has introduced so many changes in the technique, and has consequently rendered more common and less dangerous operations which in Boivin's time were but rarely attempted, that her work has become really antiquated. Whatever treatment she may have received from the hands of Lachapelle, it is evident that she bore her no ill-will, since the work is dedicated "to the memory of Madame Lachapelle, our first guide, our first teacher, the object of our common affection during life, of our admiration and of our regrets after her death," and to M. C. Duméril, who was the physician in chief to the Maison Royale de Santé.

All through the book it is evident that the literature of the subject has been thoroughly worked up, and all the important writers and their opinions are quoted in its pages. The French version with its numerous clinical cases is at times a little tedious, and we have therefore found it more agreeable to read the English translation by Hemming, this being admirable, and the footnotes which he adds being full of interest, more

especially as he quotes frequently such men as Marshall Hall, for whom he had a profound respect and to whom he dedicates his translation. It is not necessary, then, to go through the work in detail, but it is still well worth reading. We will only mention a few minor points which for some reason or other especially attracted our attention. One point in connection with the use of the drainage tube struck us more particularly on account of the disfavor into which its employment has lately fallen. In her chapter on wounds of the uterus, after speaking of a gunshot wound caused by a bullet which killed the child in utero, but which did not prove fatal to the mother, she speaks of a case in which the uterus had been penetrated and which was drained by means of a tube. She says that the tube remained in for some time, and the wound continued to discharge freely until one day, as luck would have it, the tube was forgotten and the wound very quickly healed.

Her subject is divided almost in the same way as in the modern text-books.

Of extirpation of the uterus she says, after speaking of the occasional necessity for it in prolapsus and inversion, that the operation of total extirpation is so formidable it will probably be ultimately interdicted in those cases in which the uterus is in its place.

She then goes on to mention two cases of hysterectomy performed by ignorant persons which proved successful, and several by skilled men, all of which were apparently fatal.

Her chapters on fibroids, polypi and cancers are in accord with the best teachings of those times. Of cancer she says: "The term cancer has been expunged from the vocabulary of pathological anatomy, owing to the want of precision in its use. By cancer we shall designate every affection which by converting in its progress the texture of the uterus, has a natural tendency to increase, to propagate itself on all sides, and ultimately to be itself destroyed by ulceration beginning at its centre. We shall hereafter distribute them into four chapters under the titles of the scirrhous, the fungous, the ulcerous, and the hæmatode."

In her chapter on puerperal fever she says that the causes are still unknown. "Cold operates more frequently as the occasional rather than the exciting cause, but all the facts go to refute the so-called humoral pathology."

She speaks of the success of ergot in hemorrhages of the uterus, but says it is difficult to state what are the particular cases in which it should be used. She discusses the two contradictory opinions which existed as to the origin of hysteria, and although she agrees that the theory that hysteria proceeds from a disease of the brain is not unreasonable, she thinks that as the state of the uterus so distinctly modifies the nervous symptoms, its primary and real source may be found closed to that organ, especially when we consider that undoubted though slight hysteria always exists at the time of the menopause."

She describes minutely various paroxysms, (1) suffocating paroxysms, (2) apoplectic paroxysms, (3) syncopal paroxysms, (4) cardiac paroxysms, (5) pertussiform paroxysms. Of the fourth variety she gives two examples, one being the case of no less a person than Madame Lachapelle herself. "Madame Lachapelle was affected with symptoms which had been

attributed to aneurism of the cœliac artery, and spasmodic dysphagia, which in one of her attacks almost precluded the use of food and drink for fifteen hours. In 1812 the case assumed the form of palpitations accompanied by dyspnœa, excessive anxiety and extreme debility, with general trembling and oppressed respiration. These symptoms were always attended by a profound sense of coldness, alarm, and apprehension of aneurism. After continuing for a quarter or for half an hour the paroxysm subsided, and repeated eructations announced its termination."

She gives nothing new or very strange for the treatment, but says that the cough can be cured by the syrup of morphine, a therapeutical hint of doubtful value.

In speaking of diseases of the ovaries, she raises the question whether it would not be safer and easier to remove a diseased ovary through an incision in the vagina. She cites a case of labor during which a scirrhous ovary came down and projected from the anus together with a portion of the rectal wall; this was cut off and the woman died. But she questions whether, if the case had not been complicated by the labor, and the incision had been made through the vagina, the result would have been equally fatal.

She devotes separate sections to diseases of the Fallopian tubes and those of the ovaries. In speaking of the ovaries she again mentions the operations of N. Smith and Ephraim McDowell of Kentucky, and after giving various others, reaches the following conclusion : " There are then 15 cases of this operation, namely extirpation, of which 6 have been attended with at least temporary success, 5 with neither good nor bad results, and 4 with death. In five cases the operation could not be completed. Extirpation will therefore be indicated only when the diagnosis is distinct; when the mobility and recent date of the tumor preclude the probability of adhesions, and when the absence of hardness after examination by puncture removes all fear of serious complications. Even then we should hesitate, but if we do decide upon the operation, the incision should be as small as possible, the sac should be first evacuated by puncture and afterwards drawn out in its empty state."

Several pages are devoted to injuries and inflammations of the pudenda. She recognizes three kinds of lacerations of the perinæum, the anterior, the central or posterior, and the complete laceration. She concludes by giving cases of fæcal fistula which opened through one of the labia majora.

The plates which accompany the book are excellent.

We do not pretend in this short paper that we have done full justice to the works of Madame Boivin. It is evident that she not only understood her subject, but she also knew how to write lucidly. Even if her own modest assurance is true that her works contain little that is original, at any rate we owe her a great debt of gratitude for collecting and putting in a readable form the combined knowledge of the majority of the principal authorities of her time.

BARON VON LANGENBECK, SURGEON-GENERAL OF THE GERMAN ARMY, PROFESSOR OF SURGERY IN THE UNIVERSITY OF BERLIN.

By WALTER B. PLATT, M. D.

Among the surgeons of the present century who by noble thoughts and acts inspire their pupils with unbounded admiration, there is none who has received and deserved more than Bernhard von Langenbeck, both on account of his great professional achievements as well as by reason of the rare personal qualities, which were those of a leader of men. The one made him far and away the first surgeon of his day in Europe; the other, a man most beloved by his pupils, patients and colleagues.

To how few are these qualities granted ! United with stability of purpose, they must produce a certain result. This is seen throughout his intensely active and useful life. It was my rare good fortune to know him, to see and hear him often, to meet him frequently at his own house.

The impress of his character will remain indelible. In looking over the enthusiastic and almost tearful notices written in different parts of Europe by his many pupils soon after his death, the same impression seemed to have been made upon all. There was the greatest admiration of the man as well as of the brilliant surgeon.

On the shores of the Weser just as it empties into the North Sea, Langenbeck was born November 8, 1810, in the small village of Padingbüttel. His father, George Langenbeck, was the local clergyman and chaplain. His mother's maiden name was Johanna Sussman. The father is said to have been a most excellent pastor, and teacher as well; among his pupils was Count Borries. His half-brother, that is to say the half-uncle of young Langenbeck, was the well known Professor of Surgery at Göttingen, who was among the last of those who united the branches of ophthalmology and surgery.

Young Langenbeck early showed a great fondness for knowing how various animals "looked inside," and dissected these upon all occasions. He studied under the direction of his father, who designed him for the ministry, his studies being in part such as would prepare him for theology. What passed between father and son when the latter decided upon a different course is unknown. The fact in evidence remains that he entered the University of Göttingen, October 25, 1830, taking the medical course and remaining until 1834, when he took for his graduating thesis a dissertation upon " The Structure of the Retina." In this we may see the guiding hand of the uncle. That it was not due to this alone is probable, in view of the fact that a later addition was made to the thesis, concerning " Path. Anat. Alterations of the Retina." Micro-

scopical work thus early claimed his interest, and he was speedily made a Docent in physiology and microscopy. While continuing in this branch, he soon began teaching operative surgery on the cadaver, giving private instruction with great success.

Soon after taking his degree, it is related that on returning for a visit to his father's house he was so besieged by the patients who came to seek his skill that he had to get out of a window by means of a ladder in order to make his escape. At Göttingen his courses in operative surgery attracted so much attention that he thought it best to go away, out of consideration to the feelings of his uncle, the regular Professor of Surgery. He was speedily called to the chair of surgery at the University at Kiel. Not long after, one of the Holstein wars broke out and he entered eagerly upon the career of army surgeon.

His success upon the field was so brilliant that before the war was fairly over he was called to Berlin to fill the chair of surgery, left vacant by Dieffenbach, who fell dead in his clinic when about to operate. "Youth" and "book learning" were urged against his appointment, which was delayed for a time. When he finally came in 1848 he found a crowded auditorium and enthusiastic applause awaiting him on his first appearance.

Then came other Holstein wars, in all of which Langenbeck took part, teaching as well as operating throughout his service, resembling in this respect Larrey, for whom he had great admiration. Before coming to Berlin Langenbeck had every advantage of foreign study, visiting Paris and London. In the latter city he knew Sir Benjamin Brodie, Lawrence, and Henry Green. He was especially attracted to Sir Astley Cooper, who, retired from active work, was then living at his country seat. Having no children, he made sons of his three nephews, the well-known surgeons Bransby Cooper, Aston Key, and John Tyrrel. Langenbeck was accustomed to meet them at their uncle's every Sunday, and passed delightful hours in their society. The pleasures and mutual advantage of social intercourse among professional men as shown at the meetings of the London Medico-Chirurgical Society impressed him strongly, and during his entire after-life he was fond of gathering his pupils about him. London was not revisited for forty-four years. During his thirty-four years in Berlin he founded the German Surgical Society, and for the last twelve years of his residence in that city was president of the Berlin Medical Society. When president of the German Surgical Congress he paid constant attention to every word of each speaker, although the long sittings must have been wearisome to him in his old age.

If Dieffenbach was the first great German surgeon, Langenbeck was the founder of German surgery as we know it to-day, where the constant striving is to build upon a foundation of biology and experimental pathology, where each result is subjected to the closest scientific scrutiny and criticism. He was a firm believer in carefully conducted experiments upon animals to verify or disprove the value of new surgical procedures.

He was an enthusiastic army surgeon, participating in all the Holstein wars, in the war with Austria in '66, and in the Franco-Prussian war of '70. He took the most advanced ground in military surgery regarding the ambulance system, work on the field, and the absolute neutrality of hospitals. The Red Cross movement excited his keen interest, and he attended the Geneva Conference, where decided advances were made. Any violation of the Red Cross symbol to avoid capture excited his utmost indignation. He heartily endorsed the words of the German Emperor, who nobly said, "A wounded enemy is no more an enemy, but a comrade needing our help."

He endeavored to inspire his young army surgeons with the highest ideas of duty, saying, "While we may not expect a military surgeon to know everything, yet there are things he must know to a degree approaching perfection."

Nor did he fail to illustrate his stern ideas of duty, on the bloody field of Gravelotte, when, being told that his best beloved son had been fatally wounded, replied, "I cannot leave, my duty keeps me here." He did not see him until the day following. An English surgeon who accompanied the German army during the campaign of '70 was strongly impressed with the affection and reverence the young surgeons showed for Langenbeck. In this campaign he performed a large number of those subperiosteal resections with which his name will always be associated. He notes the greatly decreased mortality where a resection can be substituted for an amputation. Wherever there was much to be done he was to be found, although he never interfered with his subordinates nor deprived them of operations which were his for the taking.

Langenbeck was a man who wrote but little when we consider the number of years he was at work. Thought and a conservative originality are on every page that came from his pen. His articles and pamphlets number but 47; his operations must reach into many thousands. He founded the *Archiv für Chirurgie*, and devised new methods of operating on hare-lip. His *uranoplastik*, an operation for the closure of cleft palate in which the mucous membrane with the periosteum is loosened from the bone, is well known. His joint resections are the best we have to-day. He was one of the earliest to advocate the immediate fixation of fractures by means of immovable dressings. Langenbeck reminds us that it was Heine who in 1830–40 did the first subperiosteal resections, upon dogs. The results of his experiments are still to be seen in the Museum of the University of Würzburg.

We must not forget to mention that while at Kiel Langenbeck was called to the chair of surgery at Munich. The appointment failed of royal confirmation, and a favorite was installed in the place.

In his early days he was one of the first to assert that glanders was caused by a micro-organism. The real organism he mistook. The microscopes and the technique of that day did not admit of following up the ultimate cause.

Langenbeck was the great teacher of surgery on the Continent. Pupils from distant parts of Europe and America flocked to see and hear him. He was especially devoted to helping young men by every means in his power to acquire what they came for. Many of his pupils are now the most eminent surgeons of Germany, among them may be mentioned Billroth, Trendelenburg, Hüter, Krönlein and Bose. Billroth, Langenbeck's assistant for seven years, and now an

a father. He says, " His name is written in golden letters not only in the Book of History but in the Book of Love of all his pupils and friends," and in speaking of his immediate popularity on assuming the chair of Surgery at Berlin, said, " In a short time he had conquered the hearts of pupils, colleagues and patients." "His charm of personality captivated all. He was the inspired leader of youth, their incarnate ideal of a clinical teacher." " His place among us, or rather over us German surgeons, was at the same time by the grace of God and by our choice."

The occasion of his 70th birthday in November, 1880, might be called a love-feast. Sixteen full professors of surgery who had been either his own assistants or those of his devoted followers, gathered about him, the students of the University gave him a torch-light procession, and the citizens in general caught the enthusiasm. His was the wonderful gift of mingling freely with his subordinates without the slightest loss of their respect or admiration. Absolutely cold-blooded in operating, he was the kindest and most warm-hearted of men. To quote the words of another, " Endued with a sympathetic voice, he was at the same time fluent of speech and modest of demeanor, while he combined a charm and impressiveness of manner with an intimate knowledge of detail."

Small in stature and slight in figure, with an exquisitely refined face and a noble look in his eye, he was an aristocrat by nature and in feeling.

His life was an active one. He rose at five in the morning and took a horseback ride when the weather permitted immediately after coffee. At six he gave a course in operative surgery on the cadaver to graduates in medicine or last-year students. At eight he saw his office patients. From ten to two he attended to his private practice and made his hospital visit. At two or soon after he operated daily in his clinic upon the most difficult cases. Finishing at 4.30 p. m., he spent the remainder of the day with his friends, his family, or in writing.

He was an excellent teacher, clear in thought and expression, and careful in arrangement of his subject-matter. Langenbeck was a rapid and bold operator. He never failed to neatly cover in the large defects left after removing extensive malignant growths from the face, bringing up and turning in flaps of skin from apparently impossible places, and sending out the patient entirely presentable.

In operating he was fond of using small knives, which were sharpened in the operating room by the assistants immediately before an operation. When a knife had served him well in some important operation he was accustomed to have a small notch cut in the handle for future reference.

After an operation he invariably applied the dressing with his own hands. It was impossible not to give him your whole attention during a clinic or lecture. His earnest voice and fiery manner fascinated the beholder as if under the spell of a magician.

At the close of the Franco-Prussian war he was the recipient of honors and decorations from nearly every court of Europe, and the thanks of the Emperor, with whom he stood on the double footing of friend and physician.

Soon after his 70th birthday, with fame in no way diminished, he resigned his chair in the University on account of a cataract which interfered with his work. Retiring to his beautiful villa situated on the hills overlooking the city of Wiesbaden, he passed the remainder of his days, dying September 29, 1887, of apoplexy, at the age of 77, leaving behind him a name which men delight to honor.

[I am under obligations to addresses by Billroth and Von Bergmann, as well as to an article in the London Lancet, for such facts as were not derived from my own knowledge of Von Langenbeck and his environment.—W. B. P.]

NOW READY.

VOLUME III THE JOHNS HOPKINS HOSPITAL REPORTS.

CONTENTS.

A FATAL CASE OF PURPURA HÆMORRHAGICA, WITH EXTREME ANÆMIA.

By John S. Billings, Jr., *Assistant Resident Physician.*

[*Read before the Hospital Medical Society, April 2, 1894.*]

The patient, a boy aged ten, was admitted to Ward F, March 22, 1894, complaining of pallor and great loss of strength.

His family history was negative. No history of hæmophilia. The personal history of the boy was very good. He had had the ordinary children's diseases, and had always been a strong and healthy boy.

Eight weeks before admission his mother noticed that he was becoming pale; also that he was languid and easily tired. She first noticed the spots on the legs about five weeks later, but attributed them to bruises received while at play. This the boy denied. Two weeks before admission he began to have a slight cough, with blood-tinged expectoration. This has continued, and blood has been constantly present in the expectoration, though never in great amount.

No melæna, hæmatemesis nor hæmaturia.

The bedside note on March 23 is as follows: "Extreme pallor of skin and mucous membranes. Sclerotics pearly. Pupils dilated. Eyelids a little puffy. Gums are firm and hard; no bleeding from them. There are two small ecchymoses on the inside of cheeks. No subcutaneous hemorrhages on face. On upper part of chest and at root of the neck there are a number of ecchymoses, chiefly deep-seated, ranging in size from a pin's head to 3 mm. in diameter. Over the right shoulder there is a larger extravasation like a bruise. Several ecchymoses and one or two suggillations on the back. There is a large subcutaneous hemorrhage over the right anterior superior iliac spine. Numerous hemorrhages, large and small, on the legs. No œdema of ankles.

Liver and Spleen.—No apparent enlargement of liver or spleen.

Lungs are clear on auscultation and percussion.

Heart.—Apex beat diffuse; most marked in fifth space, in nipple line. Loud systolic murmur at apex; heard along anterior axillary fold, and very intense along left sternal margin. It is also heard in the cervical vessels.

Abdomen is negative; no tenderness; no arthritis; no enlargement of lymph glands."

Urine.—The urine showed a trace of albumen. No tube casts nor red blood corpuscles.

No blood in stools.

Twenty minims of the tincture of the chloride of iron in sweetened lemonade, three times a day, were ordered. The boy bled very easily, a small prick in the ear continuing to bleed for an hour on one occasion.

The patient seemed to improve slightly for the first few days, but on the evening of March 30th the cough became more severe and the boy complained of dyspnœa and substernal oppression. The pulse became rapid and feeble, and death took place at 4 A. M. on the 31st. No autopsy was obtainable.

Blood.—The blood count on admission was as follows: Reds 696,000, whites 4000 per cmm. Hæmoglobin 17 per cent. It showed a very severe grade of anæmia, the red corpuscles being only a little over one-tenth of the normal number. The hæmoglobin was estimated by means of a Fleischl hæmoglobino-meter, and the results are only of relative value, as the readings on this instrument are unreliable under 20 per cent. Daily blood counts were made until the day of death. The red corpuscles, as shown on the chart, ranged between 696,000 on admission and 483,000 on the 30th. There was apparently a slight rise on the 25th, but we must remember that we are dealing with relatively small differences. The limit of error with the Thoma-Zeiss hæmocytometer is, in our experience, between 100,000 and 150,000. Hence we must say that the number of red corpuscles remained practically constant. The hæmoglobin ranged relatively higher than the red corpuscles. This is not well shown on the chart.

Heated and stained specimens of the blood were examined on March 23. There were only very slight variations from the normal in the red corpuscles, consisting chiefly in moderate differences in size. No poikilocytosis. No nucleated reds were seen. The amount of hæmoglobin contained by the individual corpuscles seemed to be above normal. Many polychromatophilic red corpuscles were seen. Seventy-five per cent. of the leucocytes were of the small mononuclear variety. This includes the lymphocytes and small mononuclears of Ehrlich. No eosinophiles; no adventitious forms.

Stained specimens were examined every other day, but showed nothing farther than an increase of the small mononuclear elements to 80 per cent.

On account of the subcutaneous hemorrhages, the anæmia and the hemorrhage from the bronchial mucous membrane, Dr. Osler is inclined to consider the case one of morbus maculosus Werlhofii. This is a form of purpura with hemorrhages from the mucous membranes occurring in infants, first described by Werlhof. The blood condition is most interesting and resembles closely a case reported by Ehrlich.[*] In this case, which was one of steadily progressive anæmia secondary to excessive menorrhagia, there was absence of nucleated red corpuscles from the blood, no leucocytosis, and a marked increase in the small mononuclear leucocytes. From observation of similar cases he draws the conclusion that when the foregoing conditions obtain there is entire absence of regeneration, and that the prognosis is distinctly unfavorable. The blood condition in these cases indicates that there is either no effort at regeneration on the part of the blood-making organs, or that there is some morbific influence at work destroying the corpuscles faster than they can be produced. In a case of fatal progressive anæmia reported by Fischel and Adler[†] the anæmia was consecutive to a wound of the foot which suppurated. The blood showed all the features of a pernicious anæmia, and the post mortem examination showed typical deposition of iron in the liver. Microorganisms were found to be present in the blood a few days before death. They were

[*] Charité-Annalen, XIII. 1888.
[†] Zeitschrift f. Heilkunde, V. XXIV, Part 4

cocci and grew well on ordinary culture media. The authors claim to have produced a progressive fatal anæmia in animals by injections of cultures of this organism. No cultures were made in our case, but the history would seem to rule out anything of the sort. The absence of leucocytosis, the increase in mononuclear leucocytes, and the relatively high percentage of hæmoglobin are what one would expect to find in a case of progressive pernicious anæmia. The absence of large and small nucleated red corpuscles and of poikilocytosis is, however, against it.

The absence of poikilocytotic changes in the red corpuscles is remarkable, considering the severe grade of the anæmia. It is probably to be explained by the relatively short duration of the patient's illness. In view of the recent work done by the Russian observers and others on the bone-marrow, it is unfortunate that no autopsy was obtainable.

BLOOD CHART.
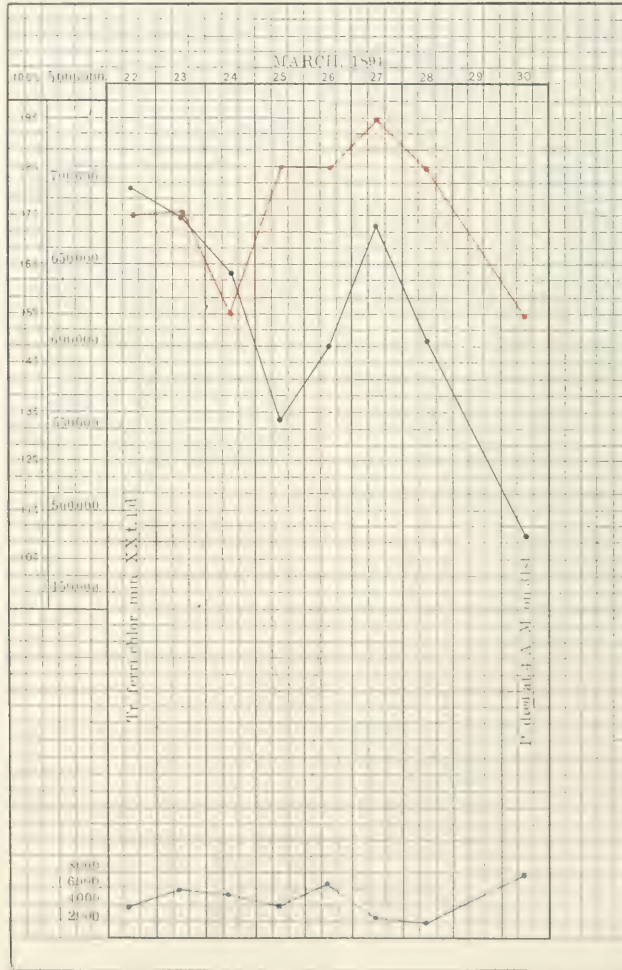
PLATE — RED CORPUSCLES.   RED — HAEMOGLOBIN   BLUE — COLORLESS CORPUSCLES.

BIOGRAPHY OF JOHN OF ARDERNE.*

By Thomas Windsor, *Manchester, England.*

All that is really known is that he was born about 1308,† practised in Wiltshire (Wilceshure and Wilteshure), M.S. f. 54, "hoc probavi in Vicecomite Wilteshure," and abroad (M.S. f. 49, "hoc probavi in uno Rege et doubus Episcopis in transmarinis partibus"), and afterwards at Newark, in Nottinghamshire, from 1349 to 1370,‡ when he removed to London, where he wrote his treatise on fistula in 1376,§ and his "Cura oculorum" in 1377.∥

It has been supposed or asserted that he was educated at Montpellier and that he practised in France as a military surgeon (Häser: Lehrb. d. Gesch. d. Med.), that he practised at Antwerp (E. H. in his transl., Sloane, 2271), that he was at the battle of Crecy (E. Milward in a . . . letter . . . concerning . . . British physical & chyrurgical authors), and that he was surgeon to Richard II and Henry IV (W. Beckett in Philos. Trans. V. 30, p. 842).

I am not aware that any of these statements can be proved; it may also be noted that he would be about 91 when Henry came to the throne. It may be mentioned that 3548 Sloane ends "explicit practica Henrici Ardern," and that in the Hunterian Library, Glasgow, there is a MS by Johannes Arderon "de judiciis urinarum," written apparently after the time of Henry the 4th.

I may just mention that the MSS. in the British Museum are almost invariably imperfect.

Contents of Manuscript of John Arderne's Works.

f. 41. Contra colicam et iliacam passionem. Modus ministrandi clysteria.

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f. 43. Contra dolorem lumborum et renum. Contra lapidem in renibus.

f. 44. Contra ulcerationes vesicæ vel renum.

f. 45. Confectio olei nardini. Regimen nefreticorum.

f. 46. Provocans vomitum

f. 47. Contra saniem mingentes. Confectia olei amigdal. Contra ardorem urinæ et excoriationes virgæ inferius.

f. 48. Contra Shawedepisse (in other MSS Chaudepisse). Scolopendria.

f. 50. Contra lapidem.

f. 52. Contra inflammationes virgæ vel vulvæ.

f. 53. Contra ulcera sub præputio.

f. 55. Contra inflationes testiculorum.

f. 57. Contra lacrimas & ruborem oculorum, etc. Modus purgandi.

f. 61. Cases of fistula ani.

f. 63. Behaviour of surgeon.

f. 67. Argentum vivum.

f. 68. Apostemata in ano.

f. 74. De restrictione sanguinis.

f. 76. Ung. Arabicum. Signum perfectæ curationis.

f. 81. Bubo est apostema infra anum in longaone. Various cases of fistula and other affections of the anus.

f. 85. Pulvis grecus. Oleum rosarum. For to make oyle of roses (in English).

f. 86. To make a gode salve for a wounde (in French).

f. 87. Ad clarificandum visum.

f. 88. Confectio pulveris sine pare. Regula de crebra remocione plagarum.

f. 90. Plaga facta cum cultello vel sagitta.

f. 95. Repercussiva simplicia.

f. 97. Morsus canis rabidi.

f. 99. Contra emorroidas (gives a list of authors made use of).

f. 104. Cauterizantia.

f. 107. For the emorode.

f. 129. Curatio virgæ inflatæ & calidæ cum rubore.

f. 130. Cura apostematum in genu.

f. 131. Cura apostematum in tibia.

f. 132. Quomodo cognoscitur caro mortua.

f. 133. Contra malum mortuum.

f. 136. Fistulæ &c. in digitis.

PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS HOSPITAL MEDICAL SOCIETY.

Meeting of April 2d, 1894.

Dr. Kelly in the chair.

An Interesting Case of Trachoma.—Dr. Randolph.

This patient has just come into the hospital and I have brought him in this evening because I expect to operate to-morrow and remove the interesting objective features of the case. It is an advanced case of trachoma or granular conjunctivitis. This disease is characterized objectively by the appearance in the conjunctiva of small granules ranging in size from a pin's head to a millet-seed and even larger. These granules attain a large size in the retrotarsal folds. The subjective symptoms are great pain and photophobia. Regarding the origin of trachoma, it seems to be now quite clear that it has a parasitic origin. Michel of Würzburg has done reliable work on this subject and has succeeded in getting out a micrococcus which is in some points like the gonococcus. Fuchs thinks that in its ultimate origin the disease is to be traced to an infection from the genitals. There is a difference between the disease as met with in this country and in Europe. It is highly infectious as seen in Europe. I have never been able to satisfy myself as to its infectiousness in this country. It is no uncommon thing in Europe for whole households to be affected. The treatment is to excise the granules and the folds, and it is interesting to note the fact that this is one of the most ancient methods of treating the disease. For a long time this method fell into disuse and was never adopted. It is now, however, in cases like this one the main method of treatment.

Exhibition of Dermatological Cases.—Dr. Gilchrist.

Dr. Gilchrist exhibited a patient, a colored woman, having an interesting papulo-squamous syphilitic eruption simulating psoriasis very closely. He exhibited also a case of psoriasis by way of contrast. Sections were exhibited under the microscope illustrating the lesions in both diseases. One of the sections was from a case of psoriasis where one of the lesions was situated on a scar which is perhaps the first case of the kind on record. This section illustrated the comparison between the normal skin, the normal scar and the psoriasis on the scar.

A Fatal Case of Purpura Hæmorrhagica, with Extreme Anæmia.—Dr. Billings. (See page 65.)

Dr. Thayer.—I have very little to add to what Dr. Billings has said. It was an extremely interesting case. He lost very little blood while in the hospital. The amount he coughed up was not enough to account for the rapidly progressing anæmia. The only thing that could possibly account for the manner in which he failed was the entire absence of effort on the part of the blood-forming tissues toward regeneration. It corresponds to the class of cases which Ehrlich spoke of years ago, and is similar to a case which he recorded in 1884 of a young woman having a very severe post-partum hemorrhage, after which the blood showed conditions not unlike this. The patient went steadily down and died in the course of a week.

Dr. Osler.—This is the second instance of this form of purpura hæmorrhagica which we have had in the hospital. One case recovered. It was severe enough to be termed purpura hæmorrhagica, as the patient had hemorrhage from nearly all the mucous membranes. We have had one fatal case of hæmophilia in a man belonging to a bleeder family.

Dr. Thayer.—In the first case referred to by Dr. Osler there was an immediate leucocytosis after the hemorrhage, and an immediate appearance in both cases of nucleated red corpuscles. In the man who died of hæmophilia, within 48 hours after the time the hemorrhage began, there were well-marked changes in the marrow of the bones.

Papillomata of the Ovary.—Dr. Cullen. (To appear in June Bulletin.)

Dr. Kelly.—Cystic papillomata of the ovary are comparatively common, and I think the reason a greater number of cases have not appeared in medical literature is that after a subject has been investigated and written up to a certain extent, there is a general tendency among writers to neglect it and to branch off into newer fields.

This subject received considerable attention among gynecologists about twelve years ago, but since then little of value has been added until Dr. Williams presented his excellent monograph as a result of his laboratory work and bibliographic research.

A considerable number of these cases have come under my observation and they are always interesting.

If the papillomatous process has not involved the peritoneum it can be completely eradicated by enucleating the diseased ovary, but if the disease has spread from the ovary to the adjacent structures only a palliative operation can be done.

The early clinical history of these cases is not suggestive of the true nature of the disease.

Unless there is a large tumor which ruptures and in that way disseminates its papillary elements throughout the peritoneal cavity, one is not apt to recognize that papilloma is present, although the patient may have been complaining for a long time.

A case which I saw in my office to-day aptly illustrates this statement. The patient, who had been complaining more or less for three or four years, was first referred to me for examination by Dr. Salzer two years ago. At that time I was unable to discover any pelvic lesion. Since then the patient has gradually declined in health, and as she again began to suspect that the pelvic organs were at fault she was referred to me for the second time. My examination to-day revealed papillomatous masses in the pelvis.

I recall another patient who had fallen into ill health ; the disease at first presented the symptoms of dyspepsia, but finally assumed a typhoidal character. As the attending physician could discover no cause for the patient's continued ill health, and wishing to eliminate the pelvic organs as a possible seat of her disease, called me in consultation.

A vaginal examination revealed a papillomatous mass involving the ovary and extending to the adjacent peritoneum. Operation was refused at that time. Two months later, after ascitic fluid had begun to accumulate, the patient was subjected to cœliotomy. A large papillomatous mass was enucleated, and although there still remained suspicious flake-like patches attached to the intestines, it was hoped that all of the diseased structures had been removed. The patient recovered from the operation, but died suddenly ten days later of a coronary embolus.

In all cases where the patient is declining in health without apparent cause, presenting ill-defined dyspeptic symptoms, or slight fullness of the abdomen suggesting a beginning ascites, a careful examination of the pelvic organs should be made.

If these cases are subjected to operation before the papillomatous process has extended beyond the affected ovary, a perfect recovery may be expected.

Dr. Welch.—This tumor is quite different from an ordinary cystoma of the ovary. Many years ago it was generally supposed that these papillomatous cysts of the ovary were nothing but ordinary cystomata which had growths on the inside and on the outside of the cyst walls. They are now known to be a distinct type of tumor of the ovary. As a rule, these cystic papillomatous tumors have nothing to do with cystomata. A cystoma of the size of these tumors would be made up of a number of small cysts. A cystoma, again, would have thick, viscid contents, whereas here the contents of two of the cysts were thin and watery. I believe these tumors belong to that class which Dr. Williams has demonstrated as springing from the germinal epithelium of the ovary. It is interesting that the same abnormal growth into papillomata has taken place on the surface of the ovary as on the inside of these cysts. I should be inclined to regard these cysts as developed from the Graafian follicles.

Dr. Kelly.—Dr. Welch will perhaps remember a very small papillomatous growth, about the size of a pea, springing from an ovary of normal size, which I removed about two years ago. In this case the diseased ovary was discovered during an operation for retroflexion. The patient has recovered completely and shows no signs of a return of the growth. I would like to ask Dr. Welch if the impression which prevailed some years ago, that monocystic tumors of the ovary are peculiarly prone to become papillomatous, is true.

Dr. Welch.—That is true.

NOTICE.

BULLETIN

OF

THE JOHNS HOPKINS HOSPITAL.

CONTENTS.

THE SIGNIFICANCE OF ALBUMINURIC RETINITIS IN PREGNANCY.

AN ANALYSIS OF FIVE CASES, WITH THE HISTOLOGICAL CHANGES PRESENT IN THE RETINA IN ONE CASE.

By Robert L. Randolph, M. D.

Two years ago I had my attention called to the importance of this subject by a case seen in consultation with Professor Kelly of the Johns Hopkins Hospital.

Case I.—Mrs. N., 31 years old ; 3 children living, and up to the 4th month of her 3d pregnancy had enjoyed good health. In the early part of the 5th month of her 3d pregnancy she began to have violent headaches, which were almost constant, and they could only be relieved by strong anodynes. These headaches persisted for two weeks, when she noticed that her sight was growing dim. Her sight continued getting worse till it had reached a stage when, from her own account, she was practically blind in one eye and the sight in the other eye was but little better. At this time an oculist was called in, who pronounced it albuminuric retinitis and suggested an examination of the urine. This was done, and the urine was found to be rich in albumen, and casts were also found. The induction of premature labor was advised and performed, and the child was born dead. The woman had convulsions, but recovered, and in a few months was in comparatively good health again. Her sight was gradually but completely restored. One year later she again conceived, and about the 4th month of pregnancy was attacked with similar headaches, though they were not quite so violent in character. Fearing that her sight would become involved, she consulted an oculist, who, from the complete description he gave of the ophthalmoscopic condition, must have made a very painstaking examination. He came to the conclusion that she was suffering with the degenerative form of albuminuric retinitis, and that if she waited for normal labor she would unquestionably lose her sight and probably her life. Her family physician then sent her to Dr. Kelly, that he might induce premature labor, giving as the main reason the condition of the eyes and the prognosis held out by the oculist. The case was referred to me by Dr. Kelly for examination. I found that her vision was $\frac{20}{70}$ in both eyes, and that there was present in both eyes a low grade of hyperopic astigmatism. As to the condition of the fundi, I found absolutely nothing to denote a progressive disease. The fundi presented all over a granular stippling, with here and there the faintest suggestions of pigmentary deposits, such a condition as is not infrequently found associated with high degrees of myopic astigmatism. The question was whether or not to induce premature labor. I may add that she had a faint trace of albumen in her urine, but no casts. There was then, in my opinion, not the slightest suggestion of albuminuric retinitis, and had she not gone nearly blind at a previous pregnancy the question of inducing premature labor would never have arisen. From my examination, then, I concluded that the evidence did not justify the induction of premature labor. I saw no signs of a progressive retinitis, and viewing the condition of the retinæ exactly as they were, and entirely uninfluenced by the previous history, I told Dr. Kelly that, so far as her eyes were concerned, I saw as yet no reason for bringing on labor. My advice was followed and the patient sent home. A few months later her family physician wrote Dr. Kelly that she had given birth to a boy and had gone through an easy labor.

Case II.—Mrs. W., 26 years old. Married 11 months. Two months after seeing Case I I was asked to see a case in consultation with Dr. T. H. West. Keyser W. V., who told me that a woman came complaining of dimness of vision and violent headaches, but he

had not laid any special stress on the latter symptom, thinking it was due simply to indigestion incident upon her condition. She was in the 5th month of pregnancy. I found that with one eye she could count fingers across the room, but could not see to read ; with the other eye she could read ordinary print. I had no test types with me and hence could not ascertain her actual vision. I found with the ophthalmoscope that the fundus in both eyes was covered with soft white patches. These white patches were nearly confluent in the worse eye, so that the fundus looked perfectly white. The patient had been in bed for nearly two weeks, as her nose would bleed every time she sat up or moved about. This nose-bleeding, then, was the only evidence of ill-health present, and until I gave my opinion as to the condition of the retinæ her physician had not thought of any serious disease. Her urine was immediately examined and found loaded with albumen ; casts were also found. There was every reason to believe that the retinitis was progressing, and inasmuch as she had nearly four months before confinement, I felt justified in advising her physician to bring on labor. I was confident that the retina would be permanently destroyed if pregnancy were allowed to continue to full term. Dr. West induced premature labor, and the latter was easy, and a dead child was born. Her sight was gradually restored, and though I never had an opportunity of making an examination, I learned that a few months after her confinement she could see as well as ever. Her health continued delicate, and her urine was never free from albumen. Three months ago Dr. West informed me that she was again in the 7th month of pregnancy and that her sight was becoming affected. She was very anxious for a child, and fearing that her physician would bring on labor, as he had done before, she had delayed revealing her condition. Her symptoms alarmed her and she sent for Dr. West late in the 7th month. At this time she had some local dropsies, very noticeable about the labia majora. The urine was rich in albumen, and her sight growing worse every day. I advised premature labor at once, and expressed some doubt whether sight would be saved, as she had undoubtedly gone too long. Her labor was an easy one and the child lived three days. Since Saturday, April 14th (Dr. West writes me), she can no longer see a person across the room.

Case III.—A. H. (colored), 26 years old. Has three children. Married five years. One miscarriage. Just before birth of second child she noticed dimness of sight. This disappeared, and her attention was not attracted to her eyes till she was four months advanced in her 3d pregnancy. Her sight grew worse every day, and all this time she suffered with the most violent and persistent headaches. Her child was born, and four months afterwards she came to the Dispensary of this Hospital. The following was the condition of her eyes : R. E. $V = \frac{2}{200}$; L. E. $V = \frac{20}{200}$. Both fundi were beset with large white plaques. In the right eye there were some opacities in the vitreous, and the optic nerve was pale. The white spots were confluent in the macula region, forming a solid white background. I found a similar condition, somewhat less marked, in the left eye, the optic nerve in this eye not being involved. The diagnosis of albuminuric retinitis was readily made. I examined the urine and found a quantity of albumen, and also casts. She was referred to the medical side of the Dispensary. She died very suddenly a few weeks later, and I succeeded in getting one of the eyes, which I hardened in Müller's fluid and studied the histological changes.

Case IV.—Mrs. S., 32 years old. Has two children. When I first saw her she had just recovered from her 2d pregnancy, when she said she had nearly lost the sight of her left eye, and the other eye was also affected. I found evidence of retinitis in the left eye. There were very minute white specks with pigmented borders collected in the macula region, also some spots of pigment in the same locality. Her vision in this eye was $\frac{20}{30}$. In the other eye, vision was $\frac{20}{30}$. I prescribed glasses for her (I may add she had a slight grade of presbyopia), and had come to me for headaches, and

lost sight of her for 18 months, when she returned with the request from her family physician, Dr. Gombel of this city, that I examine her eyes. She was in the 4th month of pregnancy, and fearing that she would lose her sight if she went on to full term, her physician sent her to me and told her that he would induce premature labor if I thought her eyesight was in danger. She was very poor, and I soon found out that neither she nor her husband wished for more children and were exceedingly anxious for a legitimate excuse for getting rid of the fœtus. I examined her eyes most carefully and found no difference in the condition from that seen some months before. There was no change in either the subjective or objective condition, and I did not think that this justified the immediate induction of labor, and so wrote to Dr. Gombel, who refused to bring on labor. She was determined, however, to have her pregnancy terminated, and four weeks later, Dr. Gombel tells me, he was called in and found her moribund with peritonitis. She had sent for a midwife, who had produced abortion that resulted in her death.

Case V.—Mrs. R., 40 years old. Has had eleven children, and is now in the 5th month of her 12th pregnancy. Ten days ago noticed that the sight in her left eye was very dim, and that she did not see as well as usual with her other eye. She had been troubled with a great deal of what she called " neuralgia of the head." This condition grew rapidly worse, especially in the left eye, the right eye remaining unchanged. When seen at the Dispensary of the Johns Hopkins Hospital she looked pale and waxy, and I elicited the fact that her feet were somewhat œdematous. Her vision in the left eye was reduced to counting fingers in three feet, and in the right eye vision was $\frac{20}{30}$. Ophthalmoscopic examination showed large white patches around the optic nerve in the left eye. The entire retina looked pale, and the outlines of the disc were blurred. No noteworthy changes in the blood-vessels. There were several small patches in the macula region. The right eye showed three small white plaques near the optic nerve ; further than this, nothing abnormal. I diagnosed the condition albuminuric retinitis, and had an examination made of her urine. This was found to contain slightly over $\frac{1}{10}\%$ albumen, and granular casts were also present. There was then no doubt about the gravity of her condition, and I advised the induction of premature labor as the only means through which she could regain her sight. I have not seen her since, but have learned that both she and her husband concluded to have nothing done and to wait and see " if nature would not bring things all right." I shall inquire into the case four months hence.

What were the prominent symptoms that characterized the histories of these five patients ? In the first three and last case the dimness of sight and headaches. In these cases there was not the slightest suggestion of kidney trouble outside of the ocular complication, and it was this latter condition that alarmed the attending physician and finally led to the discovery of more imporant and far graver conditions. It is clear then that much weight should be attached to dimness of sight occurring at any time during pregnancy.

In looking over the literature of this subject one will be disposed to divide the albuminuric retinitis of pregnancy into two classes: 1st, those cases where the eye symptoms appear before the 6th month ; 2d, those cases where the eye symptoms appear later than the 7th month. I should place cases I, II, III and V in the first class, and case IV in the second class.

Retinitis albuminurica in its relation to pregnancy is certainly worthy of more than a passing notice, and yet in the majority of obstetrical works there is no special warning to

the physician to heed all symptoms of visual disturbance, nor is even the special gravity of the condition mentioned. It is surprising to see how much has been written in this connection by ophthalmologists in the past ten years, and how in every case reported what serious conditions were present. From remarks let drop to me in talking over the cases with others, I am led to think that at least one case of eclampsia falls to the lot of most practitioners, and I think that were it possible to get the complete history of the pregnancy of eclampsia cases, in a large number eye symptoms more or less pronounced were present at some time during pregnancy, and generally in the earlier months, and it is just at this point, when the eye symptoms manifest themselves, that a serious view of the case should be taken. In the cases reported by other observers the physician in charge became alarmed at the first suggestion of eye trouble, and had an ophthalmoscopic examination made at once. It should be remembered that failing sight is often the first indication that the woman's health is failing, and is the first symptom to which she calls the doctor's attention. The retinal lesion is often the index of the systemic condition, and the slightest disturbance in sight may mean just such a lesion; and while other signs, such as large quantities of albumen in the urine, the presence of granular and hyaline casts, and œdema of the feet, are probably indispensable for a diagnosis of nephritis, these latter conditions will almost certainly be found in the pregnant woman whenever the ophthalmoscope reveals the changes in the retina known as albuminuric retinitis. But even the absence of the more obvious signs of nephritis should not lead us to underrate the significance of the retinitis, for Howe reports a case where both retinæ in May presented the typical picture of albuminuric retinitis, and where an examination of the urine during the course of four months failed to reveal albumen, and it was not till September that albumen was found, and then in considerable amount; a fact which, I think, enhances the importance of an ophthalmoscopic examination. In Case I, vision was nearly extinguished at a previous labor. As a general thing, after such an experience, the family physician warns his patient against the dangers of becoming pregnant again, as the history of most cases goes to show that with every succeeding pregnancy greater inroads are made upon the integrity of the retina. The 1st and 4th cases reported would seem to show, though, that it is quite possible for a woman who has been nearly blind from renal retinitis at labor to go through her next pregnancy without the slightest return of the eye trouble. When such cases as cases I and IV present themselves to the oculist for an opinion, unless there be evidences of an existing disease in the retina, the question of premature labor from the ocular point of view is not to be considered. Such a case should of course be returned to the obstetrician, who will be guided by other signs.

I followed this course in cases I and IV, and subsequent events verified my opinion. On the other hand, as regards cases II, III and V, there was not the slightest doubt in my mind that unless pregnancy were terminated at once blindness would follow. A retina that was so evidently diseased in its entirety would surely be destroyed if the conditions that gave rise to this disease were allowed to remain three or four months longer. Howe's statistics in these cases, when labor was not induced, show that when the woman escaped with her life it was only to remain blind forever afterward.

In those cases where the retinal trouble manifests itself in the last seven weeks of pregnancy we may give a more favorable prognosis, and unless the retinal lesion be very pronounced and the quantity of albumen great, hesitate before advising the induction of premature labor. The later the renal retinitis makes its appearance the more favorable the prognosis as regards sight, and when showing itself in the last two weeks of pregnancy, recovery of sight follows almost invariably.

1. Visual disturbances occurring in the first six months of pregnancy, and especially when associated with violent headaches, frequently mean albuminuric retinitis, and if this condition is found, to save sight, pregnancy should be at once terminated.

2. Visual disturbances showing themselves in the last seven weeks of pregnancy, while indicating the same retinal lesion, are of less grave import in so far as sight is concerned, and unless these disturbances are very pronounced and associated with wide-spread ophthalmoscopic changes, should not in themselves call for the induction of premature labor, for here their history goes to show that sight is completely restored after labor. This is especially true when the retinitis shows itself in the last two weeks of pregnancy.

3. The occurrence of renal retinitis in one pregnancy does not mean that the woman will be likewise affected in a subsequent pregnancy, and even though headaches be present and albumen found in the urine, so long as the fundi are free from the usual signs of an existing albuminuric retinitis the question of sight should not properly be considered.

PATHOLOGY.

Denissenko denies the existence of an inflammatory exudation, and regards the retinal changes as merely œdematous, and proposes to substitute the name of ophthalmia Brightica or œdematosa, for that of albuminuric retinitis. Holsti, who has investigated the subject, says that the affection comes from inflammation of the coats of the arteries, and that the walls are changed into a shining homogeneous mass resembling colloid degeneration. Maguire holds that the changes are degenerative in character and due to excessive intravascular tension, and that this alone will cause the hemorrhages and nutritive disturbances. Weeks thinks that the alterations are of a fibroid or hyaline nature taking place in the blood-vessels.

Duke Charles Theodore of Bavaria found that arteritis was very common in the retinal affections of Bright's disease, and that the chief changes are in the capillary layer of the choroid and in the retina, and more in the former. The coats of the larger vessels in the retina present a waxy structure; in other parts are homogeneous. Small masses may be pressed and hemorrhages into the sheath of the vessel. The inflammatory process is specially well marked in the capillary area between small arteries and veins. There is thickening of the vessels associated with degeneration of the walls, while the inner coats

and by œdematous swelling of the walls. The lumina are sometimes narrowed, and thromboses occur. There is an infiltration of the rods and cones by small cells, and the formation of hyaline masses in the granular layers. He did not find traces of sclerosis of nerve fibres. The arteritis is seen in vessels of the sclerotic, ciliary body, iris and conjunctiva.

Diffuse opacity of the retina is mainly due, says Saundby, to œdema, the lymph spaces around the ganglion cells of the nerve-fibre layer being distended with a clear fluid, so that these drop out of the section, leaving large spaces. We may have an effusion of coagulable lymph in the outer molecular layer, or such an exudation may separate the membrana limitans externa and bases of Müller's fibres from the rest of the nerve-fibre layer, while the layer of rods and cones may show great thickening. Small angular spots of pigment appearing in the periphery are of less importance, and are due to changes in the pigment epithelium. Sometimes, says Saundby, choroidal hemorrhages may occur, giving rise to atrophy of the choroid at this spot and pigmentary disturbance. Hemorrhages, the same author writes, occur in the sheaths of the retinal vessels. Interstitial neuritis is sometimes seen with round cell infiltration of the connective tissue of the nerve, leading in some cases to atrophy of the nerve. Ivanoff found a serous transudation into the retina in the immediate vicinity of the blood-vessels, and thinks that the outer coat of the vessels and not the inner coat is affected.

PATHOLOGICAL HISTOLOGY IN CASE III.

As regards the optic nerve itself, I think we may safely say it was normal. There might have been increased nucleation in the papilla, noticeable in and about the perivascular spaces. The main point of interest here was a beautiful endarteritis of the central artery, not amounting to obliteration, but to a considerable narrowing of the lumen of the vessel. One saw here what some authors speak of as fibrous thickening of the intima. The central vein was engorged with red blood corpuscles, a condition peculiar to the veins everywhere throughout the sections and in every part of the eye. The choroid was normal with the exception of the condition of the veins just mentioned. In the retina marked and interesting changes were present. The layer of rods and cones was absent in places, a loss due, doubtless, to mechanical violence in the preparation of the specimen. The membrana limitans externa was possibly somewhat thickened, and had a wavy course due to the pressure from the swollen inner layers. The external granular layer was increased in depth and the cells were pressed apart. Further than this there was an absence of any histological change in this situation. The external molecular layer showed marked changes—1st. The fibres of Müller were swollen and pressed apart, and in some places there were large spaces, the latter being filled with disintegrated blood corpuscles, hyaline masses, and sometimes distinct fibrillated fibrin. The walls of these spaces were lined with very fine drops of hyaline material. Fibrin in no inconsiderable amount was also present generally in that part of the layer between the spaces. Some of the smaller spaces were blocked up with hyaline masses. Here and there were small hemorrhages. At some points the spaces were so large as to invade the external granular layer. The internal granular layer presented, in the main, changes similar to those in the external molecular layer, except that there was an absence of the spaces seen in the latter. The internal molecular layer, ganglion-cell layer, and nerve-fibre never presented noteworthy changes. At points there was an enormous increase in the neuroglia (sclerosis), and this was

especially marked in the nerve-fibre layer. The fibres in this layer were swollen and somewhat translucent. This sclerosis was more pronounced in certain spots; spots no doubt corresponding to the location of the white patches seen with the ophthalmoscope. These spots of sclerosis appeared like nodes, involving all the layers of the retina down as far as the internal granular layer and almost destroying the identity of the layers as such. The nerve-fibre layer was thickened throughout, and minute hemorrhages were visible. The ganglion-cell layer presented peculiar changes. Adjacent to and within the nodes the cells were frequently absent, having dropped out of the section, leaving vacuoles. When present, some of them were much enlarged, some were smaller than normal, others without processes. With eosin-hæmatoxylin stain some of them presented a brownish red and rather singular color. The relatively great size attained by the ganglion-cells is, according to Weeks, brought about by imbibition, a part of the general œdema. Small hemorrhages and hyaline drops were present in the internal molecular layer.

The principal features then were :

1st. Great œdema of the entire retina, and as a consequence increased depth of the retina.

2d. Hyperplasia of the neuroglia, especially marked in the nerve-fibre layer.

3d. The presence of hyaline masses throughout the retina, most pronounced in external molecular layer and the formation of spaces.

4th. As a general thing the changes were more striking the nearer the disc, and this was especially true of the nodules, which here were very prominent, though they were visible along the retina almost as far forward as the ora serrata. The anterior portion of the eye was normal. Fatty degeneration of Müller's fibres observed by Leber and Duke Charles Theodore was not seen in this case, though the failure to find this condition does not disprove its existence. Müller's fluid was employed in hardening the eye, and this could account for the failure to detect the changes described by Leber and others, and in like manner postmortem changes may be held responsible.

As to the frequency of sclerosis of the neuroglia in albuminuric retinitis, I am disposed to regard it as of exceptional occurrence — if ever present at all — when pregnancy alone not associated with genuine interstitial nephritis is the cause of the albuminuria. It is frequently difficult to ascertain the subsequent history of this class of patients, but whenever the eyes have been tested some months after premature labor, in most cases useful vision was present, and there was good reason to believe that vision would still further improve. In some few cases nearly normal vision has been reported. Anything like restoration of function in a part the subject of sclerosis is certainly not in accord with our ideas of this process, as witness for example the prognosis of the same condition when present in the cerebro-spinal system, in which latter connection Flint says, "Clinical experience thus far has furnished no ground for entertaining any hope of recovery from the disease." The blindness, then, which is present in albuminuric retinitis is due to œdema of the retina, and consequent interference with the conductivity of the nerve-fibres. This œdema may be in many cases a part of the general œdema familiar to us all, an œdema which usually disappears with the removal of the fœtus. The sclerosis found in Case III leads me to conclude that the nephritis at the last was not of the parenchymatous variety, as are most of the cases of nephritis of pregnancy. The disappearance, however, of the visual disturbances and headaches at the termination of her

No. 1.

Showing how one of the nodules has invaded the retina as far as the Internal Granular Layer, and has destroyed the identity of the layers involved.

No. 3.

Swollen Ganglion Cells in Ganglion Cell Layer.
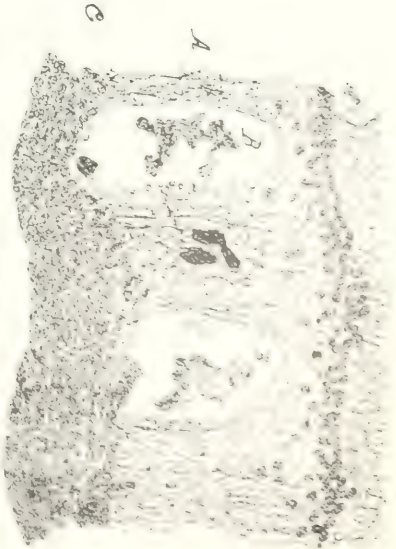
A. External Molecular Layer.
B. Spaces in External Molecular Layer, due to Loss of substance.
C. Hyaline masses.
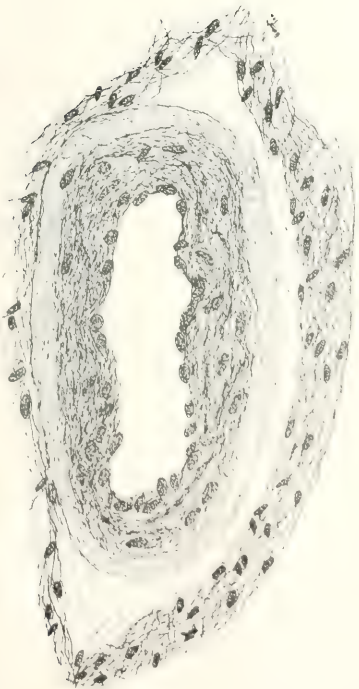
No. 4.

Endarteritis of the Central Artery.
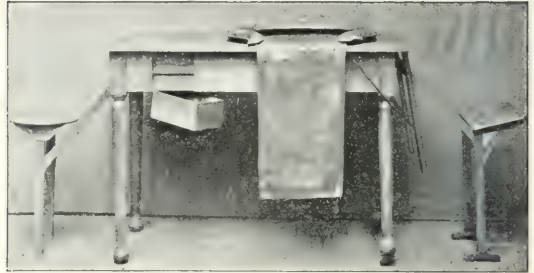
Fig. 1.—Modified Operating Table for Abdominal Section.

Fig. 2.—Modified Table for Plastic Operation.

Fig. 3.—Modified Operating Table, Trendelenburg Position.

second pregnancy speaks in favor of a parenchymatous nephritis in the early part of her history; a nephritis that in exceptional cases, as in this one, passes over into the interstitial variety; a condition that we no doubt had here, as evidenced by her sudden death, and by the clinical history of the retinitis, as well as its histological changes.

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AN OPERATING TABLE.

By Hunter Robb, M. D., *Associate in Gynecology.*

I have recently had made an operating table which is a modification of the one devised by Dr. Kelly, which you have all seen in his operating room. It is made of quartered oak and is 80.5 cm. high. The top, which when complete measures 110 cm. by 51.5 cm., is constructed in three separate pieces, which, for convenience, I will call *A*, *B* and *C*. The middle portion, *B*, measuring 15 cm., is made like an extra leaf of a table to slip in and out, so that when required the table can be at once shortened by joining *A* and *C*, so that the top consists only of these two parts. This allows the anæsthetizer to administer the anæsthetic during an operation on the cervix or perineum with the patient in the lithotomy position, without leaning forward in a constrained position, as he is obliged to do when the ordinary table is employed (Figs. 1 and 2). The part *C*, again, consists of two pieces which are joined together by hinges. The part which works on these hinges can at any time be elevated at any angle and kept in the required position by means of a wooden support 11 cm. wide and 48.5 cm. long, one end of which is attached to the table on its under surface by a double hinge, while the other can be fitted into a series of grooves in a plank which lies a little below and parallel to the top of the table. In this way we have a simple apparatus when we wish to employ the Trendelenburg position (Fig. 3). The legs of the patient when in this position rest upon a support which is attached to the elevated portion of the table at a convenient

angle. Instead of being made in one piece, the middle portion of this support, which is 30 cm. long and 30 cm. wide, is constructed to fit into grooves in the two projecting side-pieces, so that when it is no longer required it can easily be removed. This is necessary, because if left in place it would obstruct the lowering of the table when a horizontal surface is required.

The support for the feet of the patient, when undergoing an abdominal operation, can be used as a seat for the operator when he is engaged in plastic work. In the two pieces of wood which connect the seat with the table, holes are drilled which are intended to receive two pegs, the tops of which are represented by two triangular pieces of wood. When in position they can be used to support a glass basin, which thus rests just in front and within easy reach of the operator, and into which can be put the scissors, knives and any instruments which are constantly being required during a plastic operation. This seat, as well as that for the anæsthetizer, can be put out of sight, being suspended under the table at any time when not in use. The legs of the table at one end are supplied with rubber casters, so that the position of the table can be readily changed.

A wooden box is fastened on the under surface at the side of the table near the head, in which are kept the anæsthetic, cones, hypodermic syringe and other things that may be required during the operation by the anæsthetizer.

The advantages which the table possesses are as follows :

(1) it is inexpensive; (2) it can be readily sterilized; (3) it can be shortened at a moment's notice; (4) the patient can easily be placed in the Trendelenburg position at any time, even in the middle of the operation, without being removed from the table; (5) the seats for the operator and the anæs-thetizer, when not required, are out of the way; (6) a convenient receptacle for some of the most necessary instruments is put within easy reach of the operator; (7) a box is supplied to hold the ether, chloroform and cones; (8) the table can readily be wheeled from place to place.

PRIMARY CARCINOMA OF THE GALL-BLADDER.

By Delano Ames, M. D.

About one year ago the first case that I shall report this evening came into my care through the kindness of Prof. Osler, to whom I am also indebted for the histories of the two other cases reported, which occurred in this hospital.

CASE I.—*Primary carcinoma of the gall-bladder. Pain and tumor in the right hypochondrium. Absence of jaundice. Profound anæmia. Obstinate constipation for four weeks before death. Death from exhaustion six days after exploratory incision. Gall-stones.*

Miss R. H., aged 47, was in my care from May 5, 1893, to Jan. 15, 1894. She had been an invalid for some years. Her mother is said to have died from some painful liver trouble. Her previous health had never been of the best. Since childhood there is a history of attacks of pain in the right side, occurring with increasing frequency as she grew older. She never was jaundiced during these attacks and never passed calculi. She always menstruated regularly, never freely, and for the last few years has suffered more or less pain in the left inguinal region during the menstrual period. Two years ago, during a severe attack of pain in the right side, she first noticed a slight swelling just below the right costal margin in the mammary line. This subsided with the pain. The duration of these attacks was from six to eighteen hours.

Aside from this trouble, and with the exception of a troublesome cough, for which she sought the climate of southern Europe two winters ago, she had been free from disease.

Her appetite was only fair at all times. Her bowels moved from 2 to 3 times a day.

On my first visit, May 5th, I made the following note: "Patient is fairly well nourished. Complexion sallow. No jaundice. Conjunctivæ are colorless. Mucous membranes of mouth are very pale. Ears waxy. Pulse 84, volume and tension good.

Thorax :—Fairly well developed. There is a small amount of subcutaneous fat. Expansion good, but apparently slightly restricted at left apex, where the expiration is somewhat prolonged. No râles are to be heard. Heart negative.

Abdomen :—Soft. Walls are thin. Just below the right costal margin the surface is a little elevated in a small area in the mammary line. There is tenderness here to slight pressure, and she tells me that yesterday when the pain was more acute this elevation was more marked. Liver dullness begins at the 6th rib. The border is palpable about two fingers-breadth below the costal margin and is painful to pressure. The surface is smooth and firm. The left lobe is not palpable." The urine examined a few days later was free from albumen and casts, but showed slight traces of biliary coloring matter. Hæmoglobin was not estimated at this time, but three months later, after the patient had been in the country all summer, it was between 28 and 30 per cent.

A few days later the slight elevation noted on my first visit was found to be much accentuated and to be extremely sensitive to pressure. The patient was having a severe attack of pain in the right side.

Dr. Osler saw the case at this time and believed it to be probably one of chololithiasis of long standing, with adhesions of the gall-bladder to surrounding parts; the recurring attacks of swelling and pain in the region of the gall-bladder being referable to intermittent obstruction of the cystic duct. Operative interference was not advised on account of the patient's anæmic condition.

From September until December the patient's condition remained practically stationary, but from the latter date she began rapidly to grow worse, having several severe attacks of pain in the former place within a short time. During one of these attacks her temperature rose to 101°, but quickly subsided. After the attack the liver border was found to be somewhat lower than on the first examination. With the pain, as with all previous and all subsequent attacks, there was a slight menstrual flow and pain in the left inguinal region. This latter pain always accompanied defecation, and was increased if the stools were loose or the action constipated.

Although from this time the patient grew steadily worse, her appetite improved and there was no noticeable emaciation. Another marked change occurred; instead of having from 2 to 3 stools a day she suddenly and without apparent cause became obstinately constipated.

An examination made the middle of December showed the liver border palpable on a line with the umbilicus. The left lobe was still not palpable. There had thus been a noticeable descent of the right liver border in a short time.

On Christmas day occurred the most severe attack of pain yet experienced. The whole right hypochondrium was distinctly bulged; the liver border was 1 to 2 fingers-breadth below the umbilicus, and beneath it could be felt a rounded mass, which by bimanual palpation, one hand in the flank and one over the liver border, could be slightly moved up and down. It was not possible to make out any fluctuation. There was great tenderness, not only at the liver border, but over the whole liver surface. Twelve hours later the bulging was much less perceptible, the pain had gone, though some tenderness remained and the liver border was again on a level with the umbilicus.

Within eight days a second similar attack occurred, at which time it was decided that operative interference was advisable, as all the symptoms pointed to a probable occlusion of the cystic duct. An incision was therefore made by Dr. Tiffany on January 9th. The gall-bladder was found to be the seat of a cancerous growth and to be firmly adherent to surrounding parts. The patient died six days later from exhaustion.

The autopsy was made the following day at the bedside, and as we were not allowed to remove the organs, the report is far from being as full as would be desired.

The gall-bladder was enlarged to about the size of a large orange. It was dark brown in color; its walls were much thickened and the seat of a carcinomatous growth. On section, its cavity, which was small, contained a little brownish fluid, mushy detritus, and what was of most interest, the disintegrated remains of several gall-

stones. The mass was adherent to the duodenum for several inches below the stomach. It was also adherent to the under surface of the liver, and had, as it had grown, drawn down a tongue-like process of liver tissue in the way recently described by Riedel.

The liver, so far as could be seen, was free from secondary deposits, though it is very probable that a closer examination would have disclosed some metastatic nodules, as invasion of the liver in these cases is very common.

There was no constriction of the intestines. The lumen of the duodenum was normal. No growth was found at the pylorus or in the pancreas. The left ovary was cystic, about the size of a walnut and adherent to the rectum. This fact probably explains the pain in the left inguinal region referred to.

Case II.—*Cancer of the gall-bladder. Jaundice. Progressive emaciation.*

E. S., aged 54, female, admitted to ward G, January 25, 1893, complaining of pain in the abdomen and of soreness in the back. There is nothing of moment in the family history. She has been married, has had six children and four miscarriages. Has never had uterine trouble, and no serious illness until the present attack.

More than a year ago she had quite severe pains in the back accompanied with high-colored urine. After several of these attacks she passed small calculi in the urine. She has had none of these attacks and has passed no stones for about a year. For the past few months she has been failing in health, has had indigestion, belching, and occasional attacks of vomiting. She has lost much weight. About five weeks ago she noticed that she was growing yellow, and for about the same length of time she has had a dull aching pain in the right side of the abdomen. The urine has been high-colored, and the stools, formerly dark in color, have been light gray.

Present condition :—Patient is a medium-sized woman, face is thin, but the body and limbs are still well nourished. There is a moderate jaundice. Abdomen is full. On palpation it is soft, nowhere painful except at a point 5 cm. below the costal margin in the nipple line. Here is a firm mass which extends to the left to within 6 cm. of the umbilicus, and at this border the fingers can be placed directly beneath it. Below it reaches to the transverse navel line, and is here rounded and the finger cannot be placed beneath it so well. To the right the margins are not very clearly defined, but the mass extends nearly to the tip of the 10th rib. Above it cannot be separated from the liver. It feels like a rounded mass the size of a lemon or a little larger, is extremely resistant, hard, and though it has the situation of the gall-bladder, scarcely conveys the impression of the rounded pear-shaped outline of that organ. The right kidney cannot be felt. The mass, though directly continuous with the liver, presents a flat tympany on percussion. Deep pressure from behind in the flank presses the mass forward.

The spleen is not enlarged, stomach not dilated, the pelvis is clear. The urine is dark-colored and there are a few granular casts. The stools are clay-colored and very offensive. Repeated examinations showed essential changes in the condition of the tumor mass. The jaundice became very much more intense, though the general symptoms were somewhat ameliorated. She took her food better and had much less pain. The case was regarded as tumor of the gall-bladder associated with gall-stones and probably malignant disease. The patient's condition was so satisfactory that it was thought advisable to have an exploratory operation to determine the exact nature of the trouble. Therefore, on February 8th Dr. Halsted made an exploratory incision. The mass described was in the position already referred to between the transverse colon and the under surface of the liver, to which it was firmly adherent. The adhesions to the colon were so tight it was thought inadvisable to attempt to separate them. The tumor mass was firm, solid, and grayish white in color ; it passed beneath the surface of the liver and occupied the position of the gall-bladder. The

liver itself was not enlarged, but the edge could readily be felt about 6 cm. above the lower border of the tumor mass.

The wound healed, but the jaundice persisted and she got progressively emaciated. Her friends took her home on March 2, where she subsequently died.

Case III.—*Persistent jaundice with emaciation and ascites. Nodular tumor at the edge of the right liver lobe.*

Magdelen H., aged 52, admitted to ward G, October 18, 1892, complaining of swelling of the abdomen and legs.

Her father died of tuberculosis. No history of cancerous disease in the family.

The patient has always been a very healthy woman ; was married at 22 and has had one child. Has been troubled for many years with constipation. She has never had attacks of colic.

The present illness, dating from the middle of June, began with vomiting, after which she became yellow and had an itching of the skin. The jaundice has never entirely disappeared. The legs became swollen about the end of August, and the abdomen six weeks ago. There has been pain in the back so that she always has to lie on the side ; otherwise she has not much distress. The stools have been yellow. She has had but little vomiting. There has been progressive loss of flesh and strength.

Present condition :—The patient is much emaciated and has an intense olive-green jaundice. There is general anasarca. The abdomen is extremely distended and the lower zone of the thorax is expanded. Without going into details foreign to the main point, it may be said that she had all the signs of obstructive jaundice and an ascites which required frequent tapping. The immediate interest in the case was in the condition of the liver. After tapping, this was distinctly palpable, and in the parasternal line the rounded edge could be clearly felt about two fingers-breadth from the costal margin. Passing towards the flank in the anterior axillary line a prominent nodular mass was reached, and here the liver border was nearly 7 cm. below the costal margin. The mass felt about the size of a walnut, was prominent, not umbilicated. No other masses could be felt, but the edge of the liver in the parasternal line was somewhat irregular.

Autopsy :—This showed a primary carcinoma of the gall-bladder, the end of which was the nodular mass which was so definitely felt on palpation. The walls were greatly thickened and the bladder contained about 100 small stones. There was great induration about the common duct, the head of the pancreas and in the gastro-hepatic omentum. The common duct passed through this mass and was almost occluded. The liver weighed only 1500 grammes, and presented numerous medium-sized cancerous nodules throughout its substance.

In all these cases, but especially in the first and third, it was difficult to make an exact diagnosis from the symptoms and signs. In Case I, although all the symptoms pointed to trouble about the gall-bladder, there was no jaundice, and though malignant disease was thought of, the diagnosis of cancer was not made because of the absence of cachexia and emaciation. One point in favor of the diagnosis of cancer was the profound and obstinate anæmia, the hæmoglobin never registering above 28 to 30 per cent. The case was regarded as one of long-standing cholelithiasis until the operation showed the presence of a neoplasm.

The chief points of interest about the case were : the rapidity with which the unfavorable symptoms developed ; the rapid apparent increase in the size of the right lobe of the liver while the left remained normal ; the intermittent swellings in the right hypochondrium ; the absence of jaundice, cachexia and emaciation ; the presence at autopsy of apparently disintegrating gall-stones.

In Case III the persistent jaundice and loss of weight suggested a new growth, but whether in the stomach, in the pancreas or in the liver, it was almost impossible to say. A test breakfast showed free hydrochloric acid, and she had not much vomiting since admission to the hospital. The stools were grayish yellow, not fatty, and not suggestive of pancreatic disease. The nodular body at the right border of the liver was the main objective point in the examination, and the question was discussed—before the class—as to whether this was a secondary growth, or the projecting end of a firm, hard cancerous gall-bladder. Supposing it to be secondary cancer of the liver, the organ was not nearly so enlarged as is common in this condition at the end of five or six months. On the other hand, in primary cancer of the gall-passages the liver is not so enlarged, and the jaundice, as in this case, is intense from the outset. A point in favor of this view was the absence of evident signs of disease of the stomach, pancreas and intestines.*

At the best, carcinoma of the gall-bladder is not very easy to recognize, but in doubtful cases there are certain points with regard to sex, age, and the previous history of the patient that sometimes will assist us in making a diagnosis.

HISTORICAL.

The literature of primary carcinoma of the gall-bladder is all of comparatively recent date; the most important contributions having been made within the last five years. By far the largest number of cases have been reported since 1870. To-day cases are constantly appearing, especially in the clinics of large hospitals, and we are beginning to regard as not uncommon a disease that has hitherto been considered rare. There is reason to believe, however, as Ranvier and Fagge have pointed out, that a number of these cases are still overlooked, especially when there are large cancerous deposits in the liver, such being too hastily regarded as primary in that organ.

Previous to the year 1800, I have been able to find records of but four cases of primary cancer of the gall-bladder. Two of these are mentioned by Stoll in 1777; one by Halle in 1786, and one by Baillie in 1794. All of these are included in the series collected in 1890 by Courvoisier.

During the first half of the present century but nine cases were reported, two of which were probably secondary to cancerous growths elsewhere.

The first two of these were reported in 1839 by Heyfelder, and during the same year Cruveilhier in his Pathological Anatomy mentioned the disease in speaking of the pathology of the gall-bladder, but did not go into any detailed description of the lesion.

The first full account of a case was given in 1840, by Durand-Fardel. In this the liver was not involved. Lasaze, in 1847, published a case in which also the liver was free from secondary deposits, and was not involved by continuity of growth from the gall-bladder, the most frequent way in which the disease involves neighboring parts. During the same year Notta published an account of a case.

* Osler, Wm. Lectures on Abdominal Tumors. 1894.

In 1848, Broca, and in 1849, Rippoll, each reported a case to the Anatomical Society of Paris.

The two cases that were probably secondary were that of Burridge in 1845, which is included as primary by Courvoisier, but excluded by Musser, because of cancer of the breast of some years standing, and that of Renaud in 1848.

During the next decade (1850–1860) nine cases were reported, and the literature was enriched by a number of valuable contributions. Heschl in 1852 reported a case, and refers to two others that he had seen, both of which were associated with chololithiasis. Icery and Mahieux, in 1853, each published a case. During the remaining years of this decade articles appeared, and cases were reported by Klobe, Topinard, Lebert, Pepper, Cassignac and Markham, the latter describing a remarkable case in a young woman of 28.

From 1860–1870 fifteen cases were reported. Wagner in 1863, Gull in 1864, Cornil, Foot and Stokes in 1865, reported cases, though that of the latter was probably secondary. Frarier, Lutton and Buchereau in 1866, Moxon and Paulicki in 1867, Calmetts, Murchison and Ogle in 1868, Klebs and Willigk in 1869, also reported cases.

Since 1870, the French, hitherto the chief workers in the field, have given place to the Germans, and scarcely a year has passed but some additional contribution has been made to the subject.

During 1870, Villard published the most complete paper that had as yet appeared. He was able to collect and analyze 26 cases.

Important articles have appeared at different times, in Germany, by Kohn, Kraus, Lang-Heinrich and Zenker, who reported 8 new cases and collected 28; by Bernheim and Stiller, who added 5 new cases to the list, and by Courvoisier, who devoted a chapter of his " Pathologie und Chirurgie der Gallenwege " to a summary and discussion of 103 cases.

In England, Fagge, Moxon, Habershon, and Moore have been the chief contributors, while in this country a most interesting and important paper was published in 1889, by Musser, in which he analyzes 100 cases and gives a brief synopsis of each.

Of late years the greatest interest has attached to cases of primary carcinoma of the gall-bladder, because of the association of gall-stone with a large percentage of such cases. Two views of the relation of chololithiasis to the cancer formation are held, which will be briefly discussed in another paragraph.

SYMPTOMS.

The most important symptoms of the disease are: jaundice, presence of a tumor, pain, emaciation, vomiting and nausea, ascites, constipation or diarrhœa, loss of appetite and progressively increasing weakness.

Hemorrhages into the various tissues of the body may occur; hiccough, ptyalism and dysentery have been noted in a few cases.

Jaundice is present in a very large percentage of cases (69). It may be very slight, or progressively increasing in intensity. In a certain number it is absent. When present, it is due either to a new growth in the ducts, or occlusion of the same by stones, inflammation, or pressure from without by enlarged

glands. The skin may only present small pigmented areas, associated with more or less pronounced itching.

A tumor mass is noted very frequently. Its most frequent position is in the right hypochondrium, though it may be found occupying the area of the pylorus, or lie as low as the inguinal region. In one case it was noted in the right iliac fossa and diagnosed an ovarian cyst, the mistake being discovered upon operation.

The mass is composed either of the much enlarged gall-bladder, or more frequently of the gall-bladder and a portion of the liver attached to it.

The size may vary greatly. In some instances the whole right hypochondrium is noted as bulged, as in the first case reported this evening. The tumor may be solid or fluctuating, and at times is so movable as to have been mistaken for movable kidney.

Pain, when present, is generally complained of in the region of the liver. In the larger number of cases it is paroxysmal and lancinating in character ; the paroxysms varying in duration from a few minutes to some hours. It is frequently preceded by a sensation of weight and discomfort in the right side, and is often accompanied by darting pains in the right shoulder and arm. At times it is colicky in character and complained of in the epigastric region. In certain cases the pain increases in severity and the attacks in frequency as the disease advances. Tenderness to pressure over the tumor mass is usually present, and during the attacks of pain is accentuated.

Emaciation is not as frequent a symptom as might be expected. Musser finds it in 49 cases, but considers it probably more prevalent. In a case reported by Wagner and in the first case reported this evening, the flesh was preserved.

Vomiting or nausea is present in about one half of all cases. It is occasionally obstinate and distressing. Bloody vomit has been noted.

Ascites is occasionally present and is usually accompanied by œdema of the lower extremities.

Constipation or diarrhœa is frequently noted. They occasionally alternate. In one of the cases reported constipation set in suddenly, without apparent cause, four weeks before death. Previous to this the patient had three stools a day, with a tendency to more.

Loss of appetite, usually accompanied by symptoms of indigestion and progressively increasing weakness, frequently occurs.

Hemorrhages are noted by Musser as occurring in a few cases. In two of those that I have collected they are noted; in one, into the peritoneum and body cavity ; in the other, into the mucous membrane of the tongue and into the skin of the abdomen.

Fever, which is rarely noted, is never high. It usually accompanies the paroxysms of pain. I have found records of one case in which the temperature was subnormal most of the time.

With regard to sex we find, as we would naturally expect, knowing that chololithiasis is most frequent with women, that the largest percentage of cases of primary carcinoma of the gall-bladder occur among women.

In Courvoisier's cases there were four females to one male. Musser found that it occurred in the ratio of three females to one male ; while the ratio 4 : 1 occurs in the cases that I have collected.

There is no more satisfactory explanation for the occurrence of cancer of this kind in 3 to 5 times as many women as men than there is for the more frequent appearance of chololithiasis in the female sex.

A study of the ages at which the disease is first noticed shows that it is distinctly one of middle and advanced life, or to be more accurate, of the 5th, 6th and 7th decades. By far the largest number of cases occur between 50 and 60. In Musser's table, 29 are recorded in this decade, and in Courvoisier's, 26 as against 20, the next greatest in any decade, which occurred between 60 and 70. The number gradually rises from the first decade to the sixth, and declines to the ninth. The youngest reported occurred at 4 years, in a boy, following a fall. One is reported by Markham, in a girl of 28, and one by Schubert, in a man of 28. In Musser's table, one between 80 and 90 years is recorded, and in Courvoiser's, two.

In the cases that I have collected : one occurred between 20–30 ; none between 30–40 ; six between 40–50 ; nine between 50–60 ; four between 60–70 ; five between 70–80.

The duration is stated by Professor Stiller in his conclusions, drawn from the five cases that he had studied, to be between five to six years. This is distinctly at variance with the views held by other authors.

Courvoisier states that the disease is one of months, not years, and tabulates his cases as follows :

Duration 1–2 weeks, 3 cases ; 3–7 weeks, 14 cases : 2–3 months, 9 cases ; 3–4 months, 10 cases ; 4–5 months, 3 cases ; 5 months, 5 cases ; 6 months, 7 cases ; 7 months, 1 case ; 8 months, 1 case ; and summarizes, 36 of less than 4 months duration, 2 of longer than 6 months, the average being barely 3 months. Musser, on the other hand, assigns 6⅔ months as the average duration of the disease.

These differences of opinion can only be reconciled on the view that the different observers dated the beginning of the trouble from the appearance of different signs and symptoms.

It would seem impossible to assign any definite date for the beginning of the morbid process with anything like accuracy, because the various symptoms are known to appear at times during the progress of the disease widely different in different cases. All that we can say with confidence is that from the appearance of the symptoms the disease is one of short duration, the carcinoma developing with great rapidity.

PATHOLOGY.

As carcinoma of the gall-bladder is usually not discovered until so far advanced that such noticeable symptoms as jaundice, emaciation and pain have set in, we rarely have an opportunity to study this condition in the early stages in those who may have died from some intercurrent disease.

In such cases as come to autopsy, the gall-bladder is found to be converted in part or as a whole into a cancerous mass, usually adherent to surrounding parts, especially to the liver, duodenum and hepatic flexure of the colon. The mass is either round or pear-shaped, and in all cases where not con-

siderably dilated appears to be solid. It usually varies in size from a little above normal dimensions to as large as a child's head; the larger tumors being generally due to dilatation. It is whitish or brownish in color, has in general a firm, more or less elastic consistency when scirrhous in character, and is more soft and juicy when fungoid. As a general rule the surface is smooth, but at times it is found studded here and there with small nodules, which, according to Klebs, are secondary deposits in the overlying peritoneum.

On cutting into the mass there is found at about its center either the obliterated remains of the gall-bladder, or else its much contracted cavity, usually partly filled with a brownish fluid, sometimes purulent, and containing gall-stones or the fragments of former calculi.

The small-sized tumors are rarely made out on physical examination, while the larger ones are found either projecting below the liver border or imbedded apparently within the substance of the liver, depending, probably, on the original position of the growth; or again they are found lying under a tongue-like process of liver tissue which they have drawn down with them as they grew.

The primary position of the carcinoma may be either at the fundus or at the neck of the bladder. The position was only mentioned in twelve of Musser's cases, and occurred six times in each locality. On the other hand, Courvoisier believes that the fundus is more often the starting-point, and suggests as a reason the more constant irritation from gall-stones that would be likely to occur here.

The cancer spreads either by forming metastases in distant parts, or by continuity of growth into neighboring organs.

One form of growth by continuity is described by Courvoisier, where the neoplasm invades such distant organs as the stomach, pancreas, etc., by growing across adhesions, using them, so to speak, as bridges.

Distant organs are comparatively rarely involved by metastatic growth. The liver, however, is frequently involved in this way, the secondary deposits being generally found on or near the surface of the organ. Growth by continuity most frequently involves the liver, forming at times masses of cancerous growth much larger than the original growth in the gall-bladder. In these cases Naunyn believes that the primary growth reaches the liver probably through the bile passages (Reichert and Du Bois Raymond, Archiv, 1866, H. No. 6). Klebs suggests, on the other hand, that these may have become secondarily involved from growth in the parenchyma which has become cancerous through growth by continuity. He inclines, however, to Naunyn's view.

Willigk has reported a very interesting case in which the growth extended tree-like into the liver substance about the bile-ducts.

In most cases the growth in the gall-bladder is scirrhous in character, the walls being transformed in part or as a whole into a dense, coarse fibrous tissue, generally poor in cells, in which epithelial cells are found arranged either in solid clumps, isolated or confluent, or as alveoli and sometimes resembling the acini of glands, which may be either straight or branched. Occasionally the cells are found lying in long single rows between the fibers of connective tissue. The neoplasm is believed by many to develop either from the epithelial layer of the mucous membrane or from the glandular tissue in the mucosa. The cells are either round or cuboidal, and rarely a flat-celled growth is met with. In a number of cases in which the gall-bladder is dilated, papillary growths are found upon its inner walls that consist of solid tongues of epithelial cells, which on section may be seen running into the bladder-walls as through the muscular coat, where they often take on a glandular arrangement.

Frequently the mucous membrane is found absent in places or entirely wanting. The walls are occasionally ulcerated; where this has gone far enough, fistulous openings are formed frequently into the duodenum or transverse colon. There is in these cases generally an involvement of the intestine in the cancerous degeneration. Murchison states that of several cases of such fistula which he saw, the gall-bladder was cancerous in all but one. Degenerations occasionally occur in the cancer mass, and calcareous nodules are sometimes found.

A few pathologists, among them Förster, believe that carcinoma of the gall-bladder is in most cases secondary to a growth in the liver. This view is probably incorrect, because, as Klebs and others have pointed out, the gall-bladder is found to be uninvolved in most cases of primary liver cancer.

As to the liver itself in these cases, it is most frequently enlarged. Of the other cases, about half are atrophic and half of normal size. In a very few cases abscesses are found.

THE RELATION OF CHOLOLITHIASIS TO PRIMARY CARCINOMA OF THE GALL-BLADDER.

Two directly opposite views are held respecting the relation of gall-stone formation to cancerous growth in the gall-bladder. According to such men as Klebs, Von Schupple, Murchison, Durand-Fardel, Krauss, Zenker and others, the new growth may be directly attributed to the prolonged irritation produced by gall-stones, especially in persons predisposed to cancer. Zenker holds that an adenoma develops by irritation, and that it changes into an adeno-carcinoma, which is the primary atypical growth. On the other hand, Lutton, Lancereaux, Lang-Heinrich, Förster and others hold that the presence of the neoplasm favors the formation of calculi, and is the cause, not the result, of gall-stone formation. It is a well recognized fact that biliary concretions are found in a very large percentage of cases of carcinoma of the gall-bladder.

In Courvoisier's list, the percentage in which stones were actually found was 91 per cent. There is good reason to believe, however, that these figures should be larger, as in a number of cases in which calculi were not found there were such evidences as scars and strictures of the ducts to show the former existence of chololithiasis.

In Musser's cases the percentage was 92 per cent., while in those that I have collected stones were found in 20, were noted as absent in 1, and were not mentioned one way or the other in 7, making the percentage of cases with, to those without concretions, 95.4 per cent.

These figures are too great to allow us for an instant to suppose that the association of these two conditions is merely accidental. The most important point to be settled, and the

one which it seems would be conclusive, is whether the formation of gall-stones precedes or follows the cancerous degeneration.

Evidence in favor of the former view is plentiful, while that to support the latter is very meager, though there are a number of theoretical considerations used as arguments that it will lead us too far to discuss here.

I have been able to find but one case, *i. e.* that of Ord, cited by Musser, in which a calculus existed which was definitely proved to be post-cancerous in its formation, and this stone was not a cholesterin formation, but consisted of phosphate and carbonate of lime with altered mucus. On the other hand, there are numerous observations that go to prove the existence of stones prior to the carcinomatous growth.

In one of Zenker's cases, for example, fragments of calculi were found, and in the first case I have reported this evening the calculi were much disintegrated, which would seem to point to a degeneration, not to a formation of gall-stones. This fact, in connection with the long-standing history of biliary colic, is conclusive, and would lead us to believe that in all cases when there has been a previous history of biliary colic, and when no stones are found at autopsy, they have existed, but have undergone some such disintegration before the death of the patient.

Again, in one of the cases reported by Klobe an old stone was found with commencing cancer of the neck of the bladder. Klobe states it as his belief that the small size of the gall-bladder in many cases of cancer would be against the formation of calculi, while Zenker holds that the growth in the bladder and ducts would tend to prevent the bile entering the bladder, and so prevent the formation of stones.

Quetsch reported a case in which stones had been passed by a biliary cutaneous fistula for 3 years prior to any signs of cancer; and cases are reported in which stones were found although the cystic duct was occluded; they have also been found buried in the mass of the neoplasm.

From all these facts it would seem that if we are justified in ascribing a causative influence to local irritation in case of cancer in other situations, we should look upon gall-stones as exerting the same influence in these cases.

Finally, in closing, we may briefly summarize the most important points, following closely the conclusions reached by Dr. Musser, as follows:

1. Primary carcinoma of the gall-bladder is much less uncommon than was formerly believed.

2. It occurs most frequently in women, the ratio being 3–5 : 1.

3. It is a disease more particularly of the middle decade of life.

4. Gall-stones are found in from 91–95 per cent. of the cases, and probably bear a causative relation to the disease.

5. Metastasis is not extensive: invasion of neighboring organs by continuity, common.

6. Adhesions to adjacent organs frequently occur. Ulceration and perforation are more rare.

7. Pain, jaundice, cachexia, emaciation, tumor, indigestion, nausea, vomiting, constipation or diarrhœa, with occasional ascites and œdema, are the chief symptoms.

8. Pain occurs in 62 per cent. (Musser).

9. Jaundice occurs in 69 per cent. (Musser.)

10. Tumor occurs in 68 per cent. (Musser.)

11. The disease is always fatal, and usually in a short time, the average duration varying according to the best authorities from 3 to 6⅞ months.

12. Death is due to exhaustion, peritonitis, metastasis to other organs, and to biliary obstruction.

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PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS HOSPITAL MEDICAL SOCIETY.

Meeting of April 2d, 1894.

Dr. KELLY in the chair.

Myoma complicating Pregnancy and preventing Delivery.— Porro-Cæsarean Operation modified by dropping the Pedicle. DR. KELLY.

This patient is presented before the Society this evening, as she leaves the hospital in a short time, and I wish to review briefly the case, especially the reasons for submitting her to Cæsarean Section.

She was referred by her physician to the Johns Hopkins Hospital in the seventh month of her pregnancy, with the statement that she had a fibroid tumor preventing delivery.

Examination revealed a myoma about the size of a large orange springing from the posterior wall of the cervix, and two of smaller size on the anterior wall of the fundus. The cervical tumor blocked the inferior strait, preventing delivery of the fœtus, and was so closely wedged into the pelvis as to render myomectomy, craniotomy, or its displacement upward impossible, and thus there was but one other measure to be considered, that of Cæsarean Section.

The date of her confinement was calculated as nearly as possible, this being rather difficult to determine accurately on account of the irregular menstruation occasioned by the myomata, and she was submitted to operation near her full term.

The preparations for operation were the same as for ordinary cœliotomy. The abdominal incision was made from above the symphysis to a short distance above the umbilicus, and the uterus delivered upon the abdomen. In opening the uterus I cut through one of the myomata and the hemorrhage at first was quite profuse.

The child was rapidly delivered, and the cord was immediately clamped with artery forceps and cut. In the meantime Dr. Russell controlled the hemorrhage by grasping the cervix below the tumor.

As the danger of subsequent hemorrhage in these myomatous uteri is very great I determined to do a Porro-Cæsarean operation, modified by dropping the pedicle. Accordingly I introduced tem-

porary sutures through the uterine incision to control the slight tendency to hemorrhage at this point, and proceeded with the hysterectomy according to the method which I have adopted for the removal of large myomatous uteri.

The ovarian and uterine arteries were ligated on either side and the uterus amputated below the cervical tumor.

The flaps of the uterine stump were then accurately approximated with silk sutures, covered with peritoneum and dropped back into the pelvis. The abdominal incision was closed with buried silk sutures and the skin approximated with a subcutaneous silk suture. No drainage.

The patient leaves for home to-morrow, four weeks from the time of operation, having had an uncomplicated convalescence and now feels perfectly well. The baby died the night following the operation and the autopsy revealed atelectasis of the bases of both lungs.

Infusion of Normal Saline Solution in connection with Gynecological Operations and the Accidental Hemorrhages of Parturition.—Dr. Kelly.

During the past year I have employed infusion of normal salt solution a number of times in patients *in extremis* and I am certain that it has proved a life-saving measure in at least four cases.

The liability to hemorrhage in gynecological operations, especially in certain classes of pelvic diseases, is probably greater than in any other branch of surgery.

The blood-vessels of the pelvic organs are subject to the most varied distribution and displacement as a result of inflammatory disease and the growth of tumors, and when the tumor is a rapidly growing one and during pregnancy, the vessels often become very much enlarged and engorged. In some cases the vessels are exposed with the greatest difficulty, and the patient may lose a large amount of blood before the bleeding vessel can be reached and controlled.

In the hemorrhage of parturition, either ante- or post-partum, this measure is undoubtedly of the greatest service, and I am certain that were it more generally employed by the general practitioners of our country the rate of mortality from post-partum hemorrhage would greatly be reduced. The first occasion on which I employed infusion, with signal success, occurred in an obstetrical case. I was called to see the patient one evening and found her complaining of vague pains which lacked the force and regularity of those of normal labor. The nurse called my attention to the fact that the patient had passed a small quantity of blood, and on examination I found a large clot in the vagina.

Fœtal heart-sounds which had been present up to a short time before the beginning of labor were now absent. At first I suspected placenta prævia, but upon closer examination was unable to detect any evidence of this anomaly, and therefore concluded that it was a case of concealed hemorrhage. Proceeding upon this assumption I performed version and rapidly delivered the dead fœtus.

The amount of blood which poured from the uterus was enormous, and no one but a very strong and plethoric woman could have withstood such extreme depletion.

Never before have I seen a patient recover from such a hemorrhage. The pulse became very rapid and soon reached 160.

As there was still slight hemorrhage and the patient continued to have the severest cramp-like pains, I called assistants about five hours after the child was delivered, and after a careful examination under chloroform a piece of the placenta was found at the fundus uteri. The patient's pulse was now imperceptible and we resorted at once to infusion, following the plan suggested by Dr. Clark, which is simply a reversal of the ordinary use of the aspirator.

The receiving-bottle of the aspirator was filled about two-thirds full of normal salt solution (.6 per cent.) at a temperature of 105° F., the air-pump was reversed, forcing air into instead of exhausting air from the bottle, after which the stop-cock was closed and the

bottle inverted. While an assistant was preparing the apparatus for infusion I exposed the radial artery by a short oblique incision.

I prefer arterial infusion, as the dangers from the entrance of air are less and the beneficial result more immediate than when a vein is employed for this purpose.

Before opening the artery two provisional ligatures should be passed beneath the artery, one above and one below the point of infusion.

After making a longitudinal slit in the artery the exit stop-cock was opened and the solution was allowed to flow before introducing the blunt needle of the aspirator into the artery ; in this way all possible danger of the entrance of air is avoided. In this case there was not the slightest bleeding on opening the artery, the pulse having been imperceptible for some minutes. About one litre of fluid was infused and the effect was remarkable ; hardly had the salt solution begun to flow when the pulse of the opposite wrist became perceptible and within a short time dropped to 125 and became quite full in volume. The convalescence in this case, although slow, was perfectly satisfactory.

Only one other instance of concealed hemorrhage occurring during parturition and treated by transfusion is reported.*

In many of its details this case of Dr. Taylor, reported in the London Lancet, is similar to the one which I have just presented to you.

He was called to see a woman who was supposed to be sinking during a protracted labor. The patient's pulse was nearly imperceptible, extremities cold, and she presented all of the symptoms of profuse hemorrhage.

Examination revealed the same condition as I have just described in my case, with the exception that the membranes were partially protruding. Uterine action had ceased and no effort was made to deliver the fœtus, but resuscitative measures were at once instituted.

About ten ounces of blood were transfused from the patient's sister, a strongly-built young Irish girl. The immediate effect of the transfusion was not so gratifying as in the case which I have just detailed, but on the whole her recovery was very satisfactory. The patient was delivered of a dead fœtus about twelve hours after the transfusion.

The results of infusion in three of my surgical cases have been no less gratifying.

In April, 1893, I removed the appendages of one side for a hæmatoma of the ovary in a young woman. During the afternoon of the same day her pulse suddenly began to increase in rapidity and soon all the signs of hemorrhage became pronounced.

I reopened the abdomen and found the pelvis filled with blood and active hemorrhage still continuing—the result of a ligature slipping from the ovarian artery. While I caught and religated the bleeding vessel, Dr. Russell transfused about one pint of salt solution. In this case the pulse quickly dropped from 150 to 130 and the patient made an uninterrupted recovery.

The second case was the one of which I spoke at a previous meeting of the Society.

This patient was already excessively anæmic from profuse hemorrhage, due to carcinoma uteri, and during my attempts to perform abdominal hysterectomy the bleeding became so profuse that I was compelled to ligate both internal iliac arteries. In this case 800 cc. of salt solution were infused.

In my last case profuse hemorrhage occurred the day after vaginal hysterectomy for carcinoma, and before it was arrested the patient had become pallid, was exceedingly restless, tossing from one side of the bed to the other, expression anxious and air hunger very pressing. The radial pulse had ... when the needle was introduced.

The results in these four cases have been very gratifying, and I feel that in all cases where hemorrhage has been so profuse as to

* Taylor, London Lancet, Vol. LXXV.

threaten life no time should be lost in at once resorting to transfusion.

The method just detailed is simple, and if properly carried out perfectly safe, and by its employment we give the patient the benefit of the slightest chance for recovery.

I would especially advise arterial infusion, as it is certainly less dangerous and the immediate stimulating effect is much more marked. The rapid gain in the volume of the pulse on the opposite side is not due to the blood being forced back into the heart, but to the simple fact of resistance being supplied to the heart. The fluid is forced back to the first branches of the artery and thence gains access to the main circulation by passing through the capillaries. In this way the mixture of the blood and salt solution is more gradual than when the latter is at once thrown into the venous circulation and carried directly to the heart.

According to my judgment one or two and probably all of the patients just spoken of would have died had not infusion been employed.

Exhibition of Surgical Cases.—Dr. Finney.

Appendicitis.—In the absence of Dr. Halsted I will show some of the final results in cases operated on for appendicitis in the Johns Hopkins Hospital. We sent word to all of the living cases asking them to come here to-night, but only seven have responded.

Since the Hospital was opened, 35 cases in all have been operated on: 30 males, 5 females; 27 were adults, 7 children; 25 cases recovered, 10 died. Operated during the first attack, 19; during some recurrent attack, 8; between attacks, 6. The appendix was removed wholly or in part in 24 cases, and abscess of the appendix was simply opened in 11 cases. There was general suppurative peritonitis present in 8 cases, and of those cases in which there was a record of the bacteriological examination of the pus, in 7 a pure culture of the colon bacillus was found, in 2 the green pus organism and in 2 pure cultures of streptococcus. There were 8 cases operated upon with general purulent peritonitis, all of which resulted fatally. All of these 8 cases were *in extremis* when operated upon, and of only one had we any hopes of recovery; that one lived a week. It was a case of pure colon bacillus infection. The other 2 deaths were both cases in which a simple abscess had been opened. The one died on the second day from pneumonia with an acute nephritis complicating. The other case died on the fourth day with chronic nephritis; the patient died in a comatose condition, and the autopsy revealed very small contracted kidneys. The latter was the oldest case operated upon, a man 72 years of age. The youngest was a boy aged 12.

Reviewing the cases hurriedly, we find representatives of almost every possible variation. They all gave, at the onset, a more or less typical history, suggesting possible trouble in the appendix; later on other symptoms developed. One of the fatal cases had been treated by his family physician for 5 days for bladder trouble on account of difficulty in micturition. He had shown symptoms that undoubtedly suggested appendicular trouble, but they had been overlooked, and the one prominent symptom of difficulty in micturition had attracted attention. When the patient arrived at the Hospital he was in a very bad way; the abscess had ruptured, and there was a general peritonitis. This was a case in which the green pus organism was found. In two cases the abscess was located in the left iliac region instead of in the right. In neither had the disease been at first diagnosed, and when they reached the Hospital, one was almost moribund and the other extremely ill. Both were operated upon, and in each a general purulent peritonitis was found. We found that in each case there was an unusually long appendix, which had extended directly across to the left of the median line, just at the brim of the pelvis. The tip had been in each case the starting-point of the trouble. In the one it was gangrenous, in the other there was a perforation. Both cases terminated fatally. They were treated as are all the cases of general peritonitis, by as thorough cleansing of the peritoneal cavity as possible through the primary lateral incision, and later, if necessary, through a median incision. This cleansing process was done quickly, and the cavity drained with iodoform gauze. One of these cases was thought to be a case of volvulus, since the trouble had been located in the region of the sigmoid flexure and there had been absolute constipation for 4 or 5 days previous. In another case the abscess was situated so high up on the right side, and so close under the edge of the liver that it was impossible to differentiate it from liver abscess, although it was supposed to be a case of appendicitis at the time of the operation. In another case there was gangrene of the entire cæcum. In this case there was also a general peritonitis. The man was very septic at the time of operation and soon succumbed. In still another case, the abscess cavity was extra-peritoneal at the time of admission to the hospital. Most of the swelling was below Poupart's ligament. The operation showed that the appendix had been shut off from the peritoneal cavity, and that the abscess had begun to burrow down the front of the thigh, in much the same way that a psoas abscess does. This case recovered. Another was one of so-called catarrhal appendicitis, pure and simple. It was the case of my roommate at college, whom I had watched for a long time. There was at no time any marked rise of temperature or tumor, but there was always a tenderness over the appendix, so much so that he was incapacitated for work. He came into the hospital at my suggestion and the appendix was removed by Dr. Halsted. He recovered and is perfectly well at this date, three years later.

These cases illustrate very well different types of the disease, from the simple catarrhal variety, to gangrene of the entire cæcum; simulating a liver abscess, a twist of the sigmoid, or a psoas abscess covering pretty much the whole abdomen, and giving a wide latitude for differential diagnosis.

As far as the operation itself is concerned, we believe in operating in all cases in which there is definite indication of the existence of an inflammation of the appendix, with the following exceptions. If it is at the end of an attack, and there is given the history of preceding attacks, we rather advise waiting until this attack has subsided, operating in the interval. If it is the first attack, and a mild one, other things being equal, it is advised to wait until further developments. Of the six cases operated upon between attacks, all recovered, and in none of them at the present time is there a hernia. During the operation we isolate as much as possible the general peritoneal cavity from the seat of the trouble, by packing it off with sterilized gauze, or, in some cases, where there is considerable pus, with iodoform gauze. Of course, if there is one large pus cavity, that is simply drained, and unless the appendix presents in the wound, there is no attempt made to remove it. If there is only a little pus and the appendix can be found, which sometimes is a very difficult matter, it is separated from the adhesions and removed. A strip of iodoform gauze is inserted about the stump and brought out of the wound. Of course there is great objection to leaving the abdominal wound open, as there is always danger of a subsequent hernia, but this method seems to give the best results up to the present time.

Those of you who care to, may examine the results in the seven cases who are present. There is nothing to be seen, as you will observe, except in this man, who was operated upon about 15 months ago and the appendix removed. He now has a marked bulging of the scar almost as large as my fist. It gives him no inconvenience and he does heavy work right along. He has worn no abdominal support, contrary to our advice. In one of the other cases there is a slight impulse on coughing. I am sorry I cannot give a report on all the cases as to the existence of hernia.

Dr. Osler.—What is the objection to closing the wound in these instances of appendicitis unless there is extensive suppuration? I know a case of a physician in New York who has been much troubled after an appendix operation by just such a condition as was present in one of the cases shown here, namely, a very large hernia associated with which is a great deal of colic, possibly

due to adhesions. If I understood him aright, his appendicitis was one without general suppuration, but it had been treated by the open method, and a very large hernia had developed in a very short time.

DR. FINNEY.—I do not know that there is any objection in certain cases. The reason heretofore given for the open method has been fear of our inability to sufficiently disinfect the abscess cavity or the region about the stump. I believe that in many cases it is possible to so thoroughly disinfect this as to render it innocuous, and I propose when the next favorable opportunity presents, to close the wound tightly. A sufficient number of cases has been reported, I think, to justify such a procedure in selected cases.

Injury to the Shoulder.—This man, who applied to the surgical dispensary for treatment to-day, illustrates a very interesting form of injury to the shoulder-joint, the pathology of which I cannot satisfactorily explain. There is no description of this particular injury in any of the modern text-books, so far as I am aware. It is in our experience in the dispensary, one of the commonest injuries met with in the shoulder-joint. It is brought about in a variety of ways. We have observed it following direct violence, for example a blow or fall, striking on the shoulder, or indirectly following heavy lifting or carrying heavy weights on the shoulder, etc. Ten days ago this man fell a few feet, striking on his elbow. Since that time he has been unable to do any work by reason of the intense pain produced by motion of the arm. The condition is this: you cannot see any difference between the two shoulders on inspection. On palpation you will not feel anything different, unless occasionally a slight joint crepitus ; but you will notice an exquisitely tender point just beneath the coracoid process, and at times tenderness at a corresponding point on the posterior aspect of the shoulder. There is always a disinclination to move the arm ; it hangs as if paralyzed. You can raise it without much difficulty to the horizontal position ; bringing it forward while held horizontally is the motion that produces the greatest pain. When you let go of the arm it drops as if helpless. Dr. Thomas has examined a number of these cases and has found nothing abnormal in the innervation. There seems to be no especial tenderness along the course of any of the nerves or muscles, unless possibly over the short head of the biceps. Limited motion of the arm in any direction is attended by very slight pain. The joint itself, except at the points noted, is not sensitive to pressure. The treatment is quite satisfactory. The Paquelin cautery, applied daily, usually relieves the pain and brings back the motion of the arm in a very short time, in the recent cases. In the older cases the relief is not so rapid. The arm should be kept at rest for a few days.

Meeting of May 7, 1894.

The Lesions caused by certain so-called Toxalbumins.—
DR. FLEXNER.

The crystalline principles called ptomaines which have been isolated by Selmi, Nencki, Brieger and others, from cultures of bacteria do not, as was once supposed, represent the essentially active agents produced by pathogenic bacteria. Since the isolation of a poisonous albuminous principle from cultures of the bacillus diphtheriæ by Roux and Yersin in 1888, a number of albuminous substances have been obtained from pathogenic bacteria. The researches of Kobert, Stillman, Martin and Hellin have resulted in the separation from the castor bean and the jequirity bean of two amorphous substances, ricin and abrin, which in many respects resemble the toxic albuminous principles obtained from bacteria. We owe to Weir Mitchell and Reichert our knowledge that the toxicity of snake venom depends upon certain albuminous constituents, and Mosso and Springfeld found an exquisitely poisonous substance in the blood of eels. Moreover, the well-known effects which the blood of one species of animal exerts upon another species had led to the belief that the blood of different animals contains distinctly toxic substances. As to the precise nature of these substances, to which the name of toxalbumins has been provisionally given, there is little agreement. By some authorities they are regarded as enzymes, while a few deny altogether their albuminous nature.

The experiments which I wish to report to you briefly this evening consist of the study of the effects of some of these toxic albuminous substances upon animals, especially upon guinea-pigs, rabbits and mice. As has been indicated, the bodies derived from the several sources mentioned seem to possess certain chemical properties in common, and in considering their pathological action we shall find reason to treat them together. In considering for a moment the production of immunity, which, for many bacteria and their products, is an established fact, we find that evidence is not wanting for the toxalbumins derived from the higher plants, the phytalbumoses, whereas up to the present time no one has succeeded in rendering animals durably immune from the animal toxic proteids, although Sewall claims to have secured in pigeons an immunity from snake poison, which, however, disappeared after a time.

Ehrlich has shown us that mice, which are relatively quite susceptible to ricin and abrin, can be rendered in a high degree immune from the action of these bodies. I have repeated Ehrlich's experiments and confirmed his results ; and I have found, in addition, that immune mice which resist large doses of the drug when introduced subcutaneously, may still succumb to a similar quantity injected into the peritoneal cavity.

Having in mind the production of immunity to this substance, I have experimented on rabbits with dog's serum, but so far without success. On the contrary, I found that animals which had withstood one dose of dog's serum would succumb to a second dose given after the lapse of some days, or weeks, even when the dose was sublethal for a control animal.

The pathological lesions produced in animals by these various poisonous substances have been very imperfectly studied up to the present time. The contributions refer almost exclusively to the gross changes in organs and tissues, or consider simply the effect which is produced upon the blood, especially the alterations in coagulability. In the case of ricin or abrin poisoning, the pathological changes have been considered to depend upon an active gastroenteritis, thrombosis of vessels in the stomach and intestine followed by necrosis and ulceration from digestion. Just as little attention has been given to the tissue changes caused by the inoculation of foreign serum into animals. Heretofore it has sufficed to consider as the cause of death in the immediately fatal cases, the coagulation of the blood, especially in the right heart and main pulmonary vessels, or the production of widespread capillary thrombosis. All experimenters have, however, been confronted with cases in which, as death has been delayed for several days, this explanation was insufficient, since thrombi were not demonstrable. Ponfick, however, has shown that the kidneys suffer injury in excreting the hæmoglobin liberated by the breaking up of the red blood corpuscles, and he attributes many cases of death to the resulting nephritis and blocking of the tubules with met-hæmoglobin casts. The microscopical study of the pathological changes in the organs has convinced me of the insufficiency of these views, and the extent and not the absence of tissue alterations is most remarkable.

Some three years ago Professor Welch and myself published a short communication on the lesions produced in the tissues by the soluble products of the diphtheria bacilli. This paper, following one describing the histological lesions in kittens, guinea-pigs and rabbits caused by the inoculation of the bacilli themselves, confirmed in all essential respects the first paper. These lesions are found extensively in the tissues, and are present in the lymphatic glands generally, in the spleen, liver, intestinal canal, kidneys and heart muscle. They are characterized, moreover, by a death of cells in the affected part and they exhibit a marked tendency to occur in well-marked areas or foci, indicating that soluble sub-

stances circulating in the blood are capable of producing focal lesions.

With a view of testing further the production of focal changes in the tissues by the use of soluble poisons, I employed ricin and abrin. These substances, as already pointed out, resemble in many ways the bacterial poisons. One of the impressive results in their use was the certainty of their action. Kobert showed that 0.03 mg. per kilogram of ricin was fatal to rabbits, cats and dogs, and Ehrlich's experiments indicated that guinea-pigs were so susceptible that one gram of the substance would suffice to kill no less than 1,500,000 of these animals. Up to the present time I have experimented upon mice, guinea-pigs and rabbits with these bodies and among my experimental animals I have had acute and chronic cases. The acute cases present such a characteristic picture that it is unmistakable.

The intravenous inoculation of ricin dissolved in 10 per cent. salt solution in the proportion of 0.3 mg. to 3 mg. per kilogram of weight kills rabbits in from 18 to 26 hours. The lymphatic glands generally are found swollen, œdematous and congested. The intestines are distended with fæces resembling cholera stools, and the patches of Peyer are greatly swollen and often hemorrhagic. The spleen is much enlarged, the kidneys congested, and the liver, besides being congested, presents foci to the naked eye of yellowish or yellowish-white color, which at times are surrrounded by hemorrhagic zones.

The microscopical changes were marked. In the lymph glands besides congested vessels and hemorrhages, many of the lymphatic elements were destroyed. Cells with fragmented nuclei were abundant and karyokinetic figures numerous. The lymphatic tissue of the intestines showed in an analogous manner the destructive action of the poison, and the spleen was affected in a manner similar to the lymph glands. The liver presented a variety of forms of cell death. The endothelium of the capillaries was sometimes necrotic, and the leucocytes in the vessels were often destroyed. The liver-cells in the yellowish or yellowish-white foci mentioned were necrotic, sometimes hyaline, or very pale and vacuolated, the nuclei not uncommonly having suffered fragmentation. Again, the liver-cells were converted into a reticulated structure resembling fibrin, and indeed the foci often gave a reaction with Weigert's fibrin-stain. In these organs the lesions tend to occur in distinct foci, and the areas of necrosis attract polynuclear leucocytes in considerable numbers.

We now know that certain stimuli of a chemical nature attract and repel leucocytes as well as other cells. In undergoing necrosis certain chemical changes take place in the tissues through which the leucocytes are attracted to them, but some bacterial products are still more positively chemotactic than are these substances derived from cells. Capillary tubes were filled with solutions of ricin in normal salt solution of varying strengths, 1 to 100,000, 1 to 200,000, 1 to 500,000 and 1 to 1,000,000, and introduced beneath the skin of rabbits. Control tubes of physiological salt solution were also introduced. After 20 hours the ricin solution of 1 to 100,000 proved to be strongly chemotactic. The weaker solutions exhibited positively chemotactic properties directly in proportion to the concentration.

Chronic ricin poisoning is associated with great disturbance of nutrition. There are wasting and evidence of great blood destruction. The kidneys in such a case exhibited atrophic patches.

I have also studied the lesions caused by the blood serum of one animal when introduced in another species of animal. Thus far my studies have been confined to the action of the blood serum of man and dogs upon rabbits. The inoculated animals, as often happens, may succumb immediately, in consequence of thrombosis

of the right side of the heart, the respiratory function ceasing before the heart's action. Not uncommonly the animal experiences less severe effects, and after a variable period of depression, increased frequency of respiration, weakness and hæmoglobinuria, apparently recovers. I have found dog's serum strongly globulicidal for rabbits. Doses of 1.5 per cent. of body weight were usually fatal, sometimes immediately, at others after 10 to 12 hours. Quantities of 1 per cent. caused profound disturbances, in rare instances death, while some animals appear to recover. In the last series death may occur after several days or weeks. These cases are of especial interest as lesions are found in the tissues. While the observations which I have made are more complete as regards the action of the serum of the dog upon rabbits, the serum derived from human beings apparently acts in much the same way. These lesions resemble, but are not identical with those described in connection with the toxalbumins of diphtheria, ricin and abrin.

In the acute cases degeneration of the epithelium associated with the presence of met-hæmoglobin casts are found in the kidneys. The spleen shows a tolerably rich fragmentation of nuclei and necrosis of cells situated especially in the malpighian bodies, and the liver contains foci of necrosis of liver cells. Of especial interest is an animal which died on the 13th day. At the autopsy emaciation was marked ; the peritoneum contained an excess of fluid, the axillary glands were enlarged, the intestinal lymphatic apparatus apparently normal. The liver, which was firm in consistence, was roughened externally and dark in color. The kidneys appeared small, the capsule was not adherent, but the surface was granular. In the spleen were a number of white wedge-shaped areas, the bases at the capsule. Attached to the chordæ tendinæ of the tricuspid valve was a calcified thrombus as large as a split pea. The urine contained albumin and casts. The microscopical changes were those of chronic interstitial processes in the liver and kidneys, while the wedge-shaped masses in the spleen looked like healed infarctions. In the liver the chronic changes were best studied and their relation to degeneration and necrosis of cells was evident.

In rabbits which died at a somewhat earlier period, after 5 to 6 days, I have found coagulation necrosis of liver cells. To these areas leucocytes are not attracted in such very large numbers, and in keeping with this I have found that capillary tubes containing dog's serum, when introduced beneath the skin of rabbits and removed after 26 hours, showed slight positive chemotaxis only.

In the end the differences in the action upon the tissues of the toxic agents discussed are not so great as their correspondences, a fact which emphasizes their chemical similarity. They so affect the tissue elements as to cause degeneration and death, and are followed by reparative processes which do not restore the integrity of the tissues. And, from this study of the changes in the tissues, we have seen that acute degenerative lesions, focal in character, may be produced by soluble poisons, and these be followed by proliferation of the connective tissue of the parts, leading to chronic interstitial changes in the internal organs.

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CONTENTS.

OLIVER WENDELL HOLMES.*

By Wm. Osler, M. D.

Very fitting indeed is it that he who had lived to be "the last leaf upon the tree" should have fallen peacefully in the autumn which he loved so well. Delightful, too, to think that although he had, to use the expression of Benjamin Franklin, intruded himself these many years into the company of posterity, the freshness and pliancy of his mind had not for a moment failed. Like his own wonderful "one-hoss shay," the end was a sudden breakdown; and though he would have confessed, no doubt, to "a general flavor of decay" there was nothing local, and his friends had been spared that most distressing of all human spectacles, those cold gradations of decay, in which a man takes nearly as long to die as he does to grow up, and lives a sort of death in life, "*ita sine vita vivere, ita sine morte mori.*"

Enough has been said, and doubtless well said, by those who make criticism their vocation, upon the literary position and affinities of Oliver Wendell Holmes, and I shall spare your perhaps already surcharged ears. He has been sandwiched in my affections these many years between Oliver Goldsmith and Charles Lamb. More than once he has been called, I think, the American Goldsmith. Certainly the great distinction of both men lies in that robust humanity which has a smile for the foibles and a tear for the sorrows of their fellow-creatures.

The English Oliver, with a better schooling for a poet (had he not learned in suffering what he taught in song?), had a finer fancy and at his best a clearer note. With both writers one is at a loss to know which to love the better, the prose or the poetry. Can we name two other prose-writers of equal merit, who have so successfully courted the "draggle-tailed Muses," as Goldsmith calls them? Like Charles Lamb, Holmes gains the affections of his readers at the first sitting, and the genial humor, the refined wit, the pathos, the tender sensitiveness to the lights and shadows of life, give to the Breakfast Table Series much of the charm of the Essays of Elia.

While it is true that since Rabelais and Linacre no generation has lacked a physician to stand unabashed in the temple at Delos, a worshipper of worth and merit amid the votaries of Apollo, I can recall no name in the past three centuries eminent in literature—eminent, I mean, in the sense in which we regard Goldsmith—which is associated in any intimate way with work done in the science and art of medicine. Many physicians, active practitioners—Sir Thomas Browne, for example—have been and are known for their literary work; but, as a rule, those who have measured in professional life have courted the "draggle-tailed Muses" as a gentle pastime, "to interpose a little ease" amid the worries of practice. Few study men has alone anxiously; fewer still have rendered it. We know the names of hardly

Arbuthnot and of Akenside, but we neither know them nor their works. The list is a long one, for the rites of Apollo have always had a keen attraction for the men of our ranks, but the names fill at the best a place in the story of the litera- ture of the country, not a place in the hearts and lives of the people. Far otherwise is it with a select group of men, Gold- smith, Crabbe and Keats, at the outset members of our pro- fession, but who early broke away from its drudgery. In pride we claim them, though in reality no influence of their special studies is to be found in their writings. Two of these, at least, reached the pure empyrean, and to use Shelley's words, robed in dazzling immortality, sit on thrones

> "built beyond mortal thought,
> Far in the Unapparent."

Oliver Wendell Holmes may not reach the same exalted sphere, but he will always occupy a unique position in the affections of medical men. Not a practitioner, yet he retained for the greater part of his active life the most intimate con- nection with the profession, and as Professor of Anatomy at Harvard University, kept in touch with it for nearly forty years. The festivals at Epidaurus were never neglected by him, and as the most successful combination which the world has ever seen of the physician and the man of letters, he has for years sat amid the Esculapians in the seat of honor.

During the nineteenth century three schools in succession have moulded the thoughts and opinions of the medical pro- fession in this country. In the early period English ways and methods prevailed, and (as in the colonial days) the students who crossed the Atlantic for further study went to Edinburgh or to London. Then came a time between 1825 and 1860 when American students went chiefly to Paris, and the profession of the country was strongly swayed by the teaching of the French school. Since 1860 the influence of German medicine has been all-powerful, but of late American students are begin- ning to learn that their "wanderjahren" should be truly such, and that when possible they should round out their studies in France and England.

In the thirties a very remarkable body of young Americans studied in Paris, chiefly under the great Louis—Oliver Wendell Holmes, James Jackson, Jr., Henry I. Bowditch and George C. Shattuck, from Boston, Swett, from New York, Gerhard and Stillé, from Philadelphia, and Power, from Baltimore. They brought back to this country scientific methods of work and habits of accurate, systematic observation, and they had caught also, what was much more valuable, some of his inspiring enthusiasm. So far as I know, one alone of Louis's American pupils remains, full of years and honors—Prof. Stillé, of the University of Pennsylvania.

More than once in his writings Holmes refers to his delightful student days in France, and the valedictory lecture to his class in 1882 is largely made up of reminiscences of his old Paris teachers.

The fulness of Holmes's professional equipment is very evident in his first contributions to medicine. In the years 1836 and 1837 we find him successfully competing for the Boylston prizes, with essays on Intermittent Fever in New England, on Neuralgia, and on the Utility and Improvement of Direct Exploration in Medical Practice. Of these the essay on intermittent fever is in many ways the most import- ant, since it contains a very thorough review of the testimony of the early New England writers on the subject, for which purpose he made a careful and thorough examination of the records of the first century of the settlements. Here and there throughout the essay there is evidence of his irrepressible humor. Referring to the old writers, he says, that because indexes are sometimes imperfect, he has looked over all the works page by page, with the exception of some few ecclesias- tical papers, sermons and similar treatises of Cotton Mather, "which, being more likely to cause a fever than to mention one, I left to some future investigator." The essay shows great industry, and is of value to-day in showing the localities in which malaria prevailed in the early part of this century, and at the time at which he wrote. The essay on neural- gia is not so interesting, but is an exhaustive summary of the knowledge of the disease in the year 1836. The third disser- tation, on direct exploration, of much greater merit, is a plea for the more extended use of auscultation and percussion in exact diagnosis. The slowness with which these two great advances were adopted by our fathers contrasts in a striking manner with the readiness with which at the present day we take up with new improvements and appliances. Aven- brugger's work on percussion dates from 1761, but it was not until the beginning of this century that the art of percussion was revived by Corvisart and Laennec; while Piorry, as Holmes says, succeeded in creating himself a European reputation by a slight but useful modification in the art, referring to his pleximeter, of which in another place he says that Piorry "makes a graven image." The great discoveries of Laennec make their way very slowly to general adoption, and to this Holmes refers when he says, "it is perfectly natural that they (speaking of the older practitioners) should look with suspicion upon this introduction of medical machinery among the old, hard-working operatives; that they should for a while smile at its pretensions, and when its use began to creep in among them, that they should observe and signalize all the errors and defects which happened in its practical application."

Gerhard's work on the diagnosis of diseases of the chest was published in 1836, and with this essay of Holmes's opened to the American profession the rich experience of the French school in the methods of direct exploration in all disorders of the chest and of the heart. Holmes's essay may be read to-day by the student with great profit; it is particularly rich in original references to the older writers. Readers of the *Auto- crat* and of others of Holmes's literary works have been surprised at the readiness with which he quotes and refers to the fathers of the profession, a facility readily explained by these Boylston prize dissertations; and in their preparation he had evidently studied not only the modern authors of the day, but he had gone in the original to the great masters from Hippocrates to Harvey.

The prize essay does not constitute the most enduring form of medical literature, and though the dissertation on Malaria is in some respects one of the very best of the long series of Boylston essays, yet we could scarcely have spoken of a medical

reputation for Dr. Holmes had it to rest upon these earlier productions. A few years later, however, he contributed an article which will long keep his memory green in our ranks.

Child-bed fever was unhappily no new disorder when Oliver Wendell Holmes studied, nor had there been wanting men who had proclaimed forcibly its specific character and its highly contagious nature. Indeed, so far back as 1795, Gordon, of Aberdeen, not only called it a specific contagion, but said he could predict with unerring accuracy the very doctors and nurses in whose practice the cases would develop. Rigby, too, had lent the weight of his authority in favor of the contagiousness, but the question was so far from settled that, as you will hear, many of the leading teachers scouted the idea that doctors and nurses could convey the disorder. Semmelweis had not then begun to make his interesting and conclusive observations, for which his memory has recently been so greatly honored.

In 1842, before the Boston Society for Medical Improvement, Dr. Holmes read a paper entitled "The Contagiousness of Puerperal Fever," in which he brought forward a long array of facts in support of the view that the disease was contagious, conveyed usually by the doctor or the nurse, and due to a specific infection. At the time there certainly was not an article in which the subject was presented in so logical and so convincing manner. As Sidney Smith says, it is not the man who first says a thing, but it is he who says it so long, so loudly and so clearly that he compels men to hear him—it is to him that the credit belongs; and so far as this country is concerned, the credit of insisting upon the great practical truth of the contagiousness of puerperal fever belongs to Dr. Holmes. The essay is characterized in places by intenseness and great strength of feeling. He says he could not for a moment consent to make a *question* of the momentous fact which should not be considered a subject for trivial discussion, but which should be acted upon with silent promptitude. "No negative facts, no passing opinions, be they what they may or whose they may, can form any answer to the series of cases now within the reach of all who choose to explore the records of medical science." Just before the conclusions the following eloquent paragraphs are found, portions of which are often quoted:—"It is as a lesson rather than as a reproach that I call up the memory of these irreparable errors and wrongs. No tongue can tell the heart-breaking calamities they have caused; they have closed the eyes just opened upon a new world of life and happiness; they have bowed the strength of manhood into the dust; they have cast the helplessness of infancy into the stranger's arms, or bequeathed it with less cruelty the death of its dying parent. There is no tone deep enough for record, and no voice loud enough for warning. The woman about to become a mother, or with her new-born infant upon her bosom, should be the object of trembling care and sympathy wherever she bears her tender burden, or stretches her aching limbs. The very outcast of the street has pity upon her sister in degradation when the seal of promised maternity is impressed upon her. The remorseless vengeance of the law, brought down upon its victims by a machinery as sure as destiny, is arrested in its fall at a word which reveals her transient claims for mercy. The solemn prayer of the liturgy singles out her sorrows from the multiplied trials of life, to plead for her in the hour of peril. God forbid that any member of the profession to which she trusts her life, doubly precious at that eventful period, should regard it negligently, unadvisedly, or selfishly."

The results of his studies are summed up in a series of eight conclusions, and the strong ground which he took may be gathered from this sentence in the last one: "The time has come when the existence of a private pestilence in the sphere of a single physician should be looked upon not as a misfortune but a crime." Fortunately this essay, which was published in the ephemeral New England Quarterly Journal of Medicine, was not destined to remain unnoticed. The statements were too bold and the whole tone too resolute not to arouse the antagonism of those whose teachings had been for years diametrically opposed to the contagiousness of puerperal fever. Philadelphia was the centre of the teaching and work in obstetrics in this country, and if we can speak at all of an American school of obstetricians it is due to the energy of the professors of this branch in that city, and for the sake of the memory of the men we could wish expunged the incident to which I will now allude.

In 1852 the elder Hodge, Professor of Obstetrics at the University of Pennsylvania, published an essay on the noncontagious character of puerperal fever, and in 1854 Charles D. Meigs, Professor of Obstetrics at the Jefferson Medical College, published a work on the nature, signs, and treatment of child-bed fevers, in a series of letters addressed to students of his class. Both of these men, the most distinguished professors of obstetrics in America, took extreme ground against Holmes, and Meigs handled him rather roughly.

Nothing daunted, in the following year (1855) Holmes reprinted the essay, calling it *Puerperal Fever as a Private Pestilence.* He clearly appreciated the character of the work he was doing, since in the introduction he says, "I do not know that I shall ever again have so good an opportunity of being useful as was granted to me by the raising of the question which produced this essay." The point at issue is squarely put in a few paragraphs on one of the first pages : the affirmative in a quotation from his essay : "The disease known as puerperal fever is so far contagious as to be carried from patient to patient by physicians and nurses" (1843). The negative in two quotations, one from Hodge (1852), who "begged his students to divest their minds of the dread that they could ever carry the horrible virus"; and of Meigs (1854), who says, "I prefer to attribute them (namely, the deaths) to accident or Providence, of which I can form a conception, rather than to a contagion of which I cannot form any clear idea."

The introduction to the essay, which was reprinted as it appeared in 1842, is one of the ablest and most trenchant pieces of writing with which I am acquainted. There are several striking paragraphs; thus, in alluding to the strong and personal language used by Meigs: "I take no offence and attempt no retort. No man makes a quarrel with me over the counterpane that covers a mother with her newborn infant at her breast." He appears to the medical student not to be deterred by the statements of the two distinguished

professors which seem to him to encourage professional homicide. One paragraph has become classical: "They naturally have faith in their instructors, turning to them for truth, and taking what they may choose to give them; babies in knowledge, not yet able to tell the breast from the bottle, pumping away for the milk of truth at all that offers, were it nothing better than a professor's shriveled forefinger."

The high estimate in which this work of Holmes' is held has frequently been referred to by writers on obstetrics.

Some years ago in an editorial note I commented upon a question which Dr. Holmes had asked in his "Hundred Days in Europe." Somewhere at dinner he had sat next to a successful gynæcologist who had saved some hundreds of lives by his operations, and he asked, "Which would give the most satisfaction to a thoroughly humane and unselfish being, of cultivated intelligence and lively sensibilities: to have written all the plays which Shakespeare has left as an inheritance for mankind, or to have snatched from the jaws of death more than a hundred fellow-creatures, and restored them to sound and comfortable existence?" I remarked that there was nobody who could answer this question so satisfactorily as the Autocrat, and asked from which he derived the greater satisfaction, the *essay on puerperal fever*, which had probably saved many more lives than any individual gynæcologist, or the *Chambered Nautilus*, which had given pleasure to so many thousands. The journal reached Dr. Holmes, and I read you his reply to me, under date of January 21st, 1889:

"I have rarely been more pleased than by your allusion to an old paper of mine. There was a time certainly in which I would have said that the best page of my record was that in which I had fought my battle for the poor poisoned women. I am reminded of that essay from time to time, but it was published in a periodical which died after one year's life, and therefore escaped the wider notice it would have found if printed in the American Journal of the Medical Sciences. A lecturer at one of the great London hospitals referred to it the other day and coupled it with some fine phrases about myself which made me blush, either with modesty or vanity, I forget which.

"I think I will not answer the question you put me. I think oftenest of the 'Chambered Nautilus,' which is a favorite poem of mine, though I wrote it myself. The essay only comes up at long intervals. The poem repeats itself in my memory, and is very often spoken of by my correspondents in terms of more than ordinary praise. I had a savage pleasure, I confess, in handling those two professors—learned men both of them, skillful experts, but babies, as it seemed to me, in their capacity of reasoning and arguing. But in writing the poem I was filled with a better feeling—the highest state of mental exaltation and the most crystalline clairvoyance, as it seemed to me, that had ever been granted to me—I mean that lucid vision of one's thought and all forms of expression which will be at once precise and musical, which is the poet's special gift, however large or small in amount or value. There is more selfish pleasure to be had out of the poem—perhaps a nobler satisfaction from the life-saving labor."

Last year at the dinner of the American Gynæcological Society in Philadelphia a letter from Dr. Holmes was read referring to the subject in very much the same language as he uses in his letter to me. One or two of the paragraphs I may quote. "Still I was attacked in my stronghold by the two leading professors of obstetrics in this country.

"I defended my position, with new facts and arguments, and not without rhetorical fervor, at which, after cooling down for half a century, I might smile if I did not remember how intensely and with what good reason my feelings were kindled into the heated atmosphere of superlatives.

"I have been long out of the way of discussing this class of subjects. I do not know what others have done since my efforts; I do know that others had cried out with all their might against the terrible evil, before I did, and I gave them full credit for it.

"But I think I shrieked my warning louder and longer than any of them, and I am pleased to remember that I took my ground on the existing evidence before the little army of microbes was marched up to support my position."

Fortunately, Dr. Holmes's medical essays are reprinted with his works. Several of them are enduring contributions to the questions with which they deal; all should be read carefully by every student of medicine. The essay on Homeopathy remains one of the most complete exposures of that therapeutic fad. There is no healthier or more stimulating writer to students and to young medical men. With an entire absence of nonsense, with rare humor and unfailing kindness, and with that delicacy of feeling characteristic of a member of the Brahmin class, he has permanently enriched the literature of the race.

Search the ranks of authors since Elia, whom in so many ways Holmes resembled, and to no one else could the beautiful tribute of Landor be transferred with the same sense of propriety:

> " He leaves behind him, freed from grief and fears,
>   Far nobler things than tears,
>   The love of friends without a single foe,
>   Unequalled lot below."

THE LEUCOCYTES IN MALARIAL FEVER.

By John S. Billings, Jr., *Assistant Resident Physician.*

The blood in malarial fever has of late years offered a rich field for investigation, and many have been the articles and reports upon the subject since the discovery of the malarial parasite. These investigations have, however, been limited almost entirely to the malarial organism and the changes it brings about in the red corpuscles. Little attention has been paid to the leucocytes, and the literature on this part of the subject is scanty. The work done has been confined chiefly to the pigmented leucocytes which occur in the blood in malarial fever—a question which does not concern us.

Rieder, in his work on the leucocytoses, refers briefly to the fact that Kelsch, Von Limbeck, Fahrmann and others have found no leucocytosis in malarial fever. Indeed, one or two of them state that the number of the leucocytes falls below normal.

Kelsch (Arch. de Physiol., 1875, p. 690, and 1870, p. 490) found the leucocytes diminished from one-third to one-half in malarial fever. He also states that at the beginning of the paroxysm there is a slight transient increase in the number of leucocytes in the blood. He found that the minimum number of the leucocytes corresponded to the maximum enlargement of the spleen, and that when the size of the spleen was diminished by means of an electrical current, there was a transient increase in the number of the leucocytes.

The most exhaustive article on the subject is that of Bastianelli (Bull. d. Real. Accad. Med. d. Roma, Ann. xviii, Fasic. v, p. 487). He occupies himself chiefly with the discussion of the pigmentation of leucocytes and phagocytosis. He refers to Golgi, who holds that phagocytosis occurs regularly as a function of the leucocytes, obtaining at definite phases of development of the organism. This phagocytosis is accomplished both by the polynuclear leucocytes and the large mononuclear and transitional forms, while the lymphocytes and eosinophiles never contain pigment. Golgi also believes that phagocytosis may account for the spontaneous recovery observed in so many cases, and that it plays an important part in the prevention of all malarial fevers from becoming pernicious.

Bastianelli finds:

1. The number of leucocytes is always diminished in malarial fever.

2. The number of pigmented leucocytes increases markedly at the time of sporulation of the organism in the tertian cases; i. e., at the beginning of the febrile paroxysm.

3. In cases of spontaneous recovery no increase is to be observed in the number of pigmented leucocytes. This phenomenon of phagocytosis may occur at all stages of the cycle of evolution of the organism in the æstivo-autumnal cases.

4. The phagocytic leucocytes rapidly become necrotic and disappear from the blood. This probably accounts for the diminution in number of the leucocytes which takes place in malarial fever.

5. The phagocytosis is accomplished chiefly by the large mononuclear forms.

As regards the relative numerical proportions of the various forms of leucocytes, he only states that in post-malarial anæmia the percentage of the polynuclear elements decreases, while that of the lymphocytes and large mononuclear elements increases.

The observations here reported were undertaken with the view of determining, if possible, whether any regular variations took place in the number of leucocytes in the blood during the febrile and afebrile periods of malarial fever.

Malaria is very prevalent in the immediate neighborhood of Baltimore, and we see three types of fever, as follows:

1. The spring or tertian type. This is most common in the spring and early summer, though cases are often seen in the autumn. The paroxysms occur every other day if the case be one of single tertian, and daily if it be one of double tertian; i. e., with two sets of organisms in the blood, maturing on alternate days. This latter form is the commonest type we see here.

2. The quartan type. This is rarely seen, there being only five cases on record in the hospital. The paroxysms are rarely as severe as those in the previously mentioned type of the disease. They may occur every third day, two out of every three days, or every day, according as there may be one, two or three sets of organisms in the blood.

3. The fall type. This is the æstivo-autumnal type of the Italian observers, and occurs in the late summer and fall. The course of the fever is irregular. There may be definite paroxysms, as in the tertian type of the disease, or the temperature may be continuously elevated for days. The paroxysms may occur daily, or there may be no regular periodicity.

The counts were made with the Thoma-Zeiss hæmocytometer, the same instrument being used in each case. Care was taken that the counts should not be made within two hours after meals. In about half the cases the large one to twenty mixer was used, with the one-third per cent acetic acid solution as a diluting medium. In the remainder the smaller one to one hundred mixer was used, with Toison's fluid as a diluent. The results obtained with the latter instrument seem fully as accurate as those with the former. Four whole fields were counted in each case.

The relative numerical proportions of the various forms of leucocytes were estimated by means of dried and stained coverglass preparations. These were hardened by heat according to Ehrlich's method, and stained with the Ehrlich-Biondi triple stain as modified by Thayer. The counting was done with a mechanical stage, and the number of leucocytes counted varied. In all cases at least two hundred and fifty were counted, and in one or two as many as one thousand. The nomenclature used is according to Thayer, which is a modification of these used by Ehrlich and Uskow. The polynuclear and small mononuclear forms of Ehrlich are given together under the head of small mononuclears, while the large mononuclear and transitional forms are reckoned together as large mononuclears. It is difficult to draw any hard and

fast line between these two groups. Any mononuclear element one and one-half times as large as a red blood corpuscle was counted as a large mononuclear. According to this rule a large lymphocyte would be occasionally classified among the large mononuclears, while on the other hand the small transparent forms of Uskow would be counted among the small mononuclears. The difference was never more than one per cent, however.

The cases have been tabulated for convenience sake, and as little superfluous matter added as possible.

In looking over the table of tertian cases it is striking to note the uniform diminution in number of the leucocytes during the febrile paroxysm [leucocytolysis?]. It is also to be noted that the maximum number of leucocytes is found as a rule two or three hours after the chill. From that time on there is a progressive diminution until the minimum number of leucocytes is reached at the end of the paroxysm when the temperature is subnormal, which it usually is for some hours. The number of leucocytes then rises somewhat, and during the interval occupies a position about midway between the maximum and minimum above mentioned. The increase at the beginning of the paroxysm does not take place until after the chill, as the average number of leucocytes just before the chill is very slightly higher than the average number during the interval. These points are well shown if the average number of leucocytes at the different stages of the paroxysm be represented graphically together with the average temperature at those times.

The strong objection to the occurrence of this apparently regular oscillation of the number of leucocytes is the fact that the differences involved are so extremely small as to almost come within the limit of error of the hæmocytometer. This may be placed at two thousand at the outside, if sufficient care be taken. While we may be in doubt as to the occurrence of an increase in the number of leucocytes in the blood at the beginning of the malarial paroxysm, there can be little doubt that there is a definite diminution in the number of the leucocytes toward the end of the paroxysm. The difference between the average maximum and the average minimum number of leucocytes is 4271, which is well outside of the limit of error. The average number of leucocytes three hours after the beginning of the paroxysm is only 2300 more than the average number just before the beginning of the paroxysm. Yet this increase, slight as it may be, occurs in seven of our ten cases,

Black ——— leucocytes.
Broken ——— temperature.
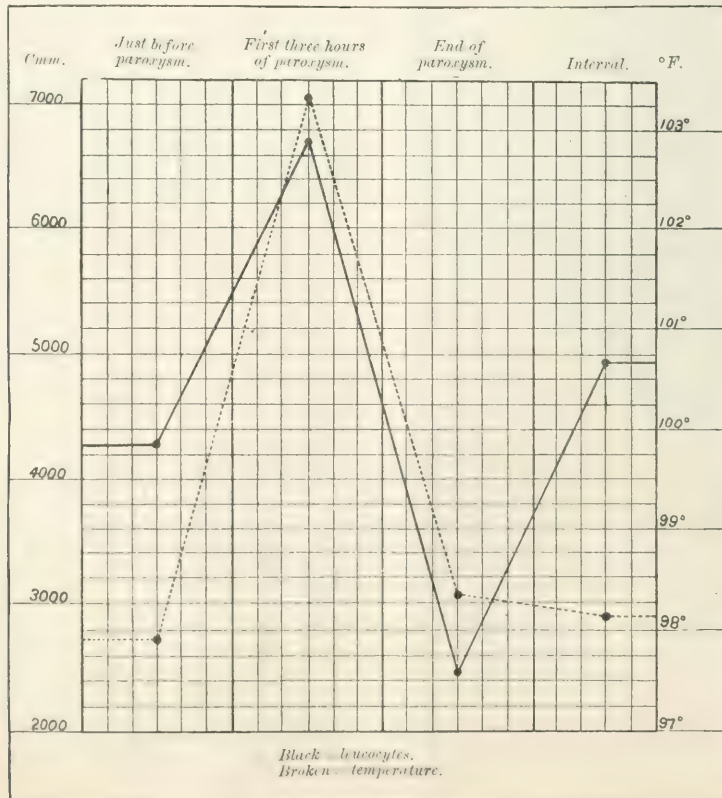
No.	Patient.	Date Admitted. / Previous Duration.	Type of Organism.	Date.	Hour.	Temperature.	Leucocytes per cmm.	Remarks.	Per cent. Polynuclears.	Per cent. Small Mononuclears.	Per cent. Large Mononuclears.	Per cent. Eosinophiles.
1.	K.—Male, 26. White.	August 18, 1893. Illness began August 16, 1893. Daily paroxysms.	Tertian (double).	Aug. 18.	1 P. M.	104.2°	3250	Beginning of chill.	68.2	15.1	15.6	1.1
					4 P. M.	103.6°	6000	. . .	73.2	11.9	14.1	.8
					6 P. M.	101.6°	4100	. . .	68.4		20.3	2.1
					12 mid.	97.8°	2000	. . . . . .	54.7		23.8	1.
2.	M.—Male, 33. White.	August 16, 1893. Illness began August 11, 1893. Daily paroxysms.	Tertian (double).	Aug. 19. Aug. 20.	1.45 P. M.	101°	3500	Beginning of chill.	71.3	17.4	11.1	.2
					10 A. M.	97.2°	4500	. . . . . .		7.3	24.2	.5
					10 P. M.	103°	2666	Chill began at 2 P. M.	52.7	12.8	33.2	1.3
				Aug. 21.	9 A. M.	97°	2500	. . . . . .	49.8	18.6	30.9	.3
3.	S.—Male, 17. White.	August 21, 1893. Illness began August 14, 1894. Paroxysms every other day.	Tertian (single).	Aug. 23.	9 A. M.	100.2°	6060	Beginning of chill.	82.1	12.1	5.1	.7
					10 A. M.	103.6°	7750	. . . . . .				
					11 A. M.	103.2°	7500	. . . . . .	75.8	7.1		1.1
					12 M.	102.6°	4750	Sweating.				
					1 P. M.	100.1°	5000	. . . . . .				
					4 P. M.	99°	3560	. . . . . .	66.	22.4	10.6	.3
				Aug. 24.	12 M.	98°	3750	. . . . . .	65.1	23.7	9.2	2.
4.	Same case.	. . . . . .	. . . . . .	Aug. 25.	8 A. M.	102°	7250	Beginning of chill.	78.1	12.1	7.4	2.1
					10 A. M.	104.8°	9750	. . . . . .	79.2	8.1	12.4	.6
					12 M.	102°	6750	Sweating.	70.8	11.1	13.7	.4
					2 P. M.	100°	6000	. . . . . .	64.	13.5	21.5	1.
					4 P. M.	98.6°	5250	. . . . . .				
					8 P. M.	98.6°	5000	. . . .	63.2		8.8	6.
5.	S.—Male, 20. White.	August 24, 1893. Illness began August 10, 1893. Daily paroxysms.	Tertian (double).	Aug. 24.	8 P. M.	98.6°	3000	. . . . . .	63.1	21.8	14.	1.1
					11 P. M.	105°	2250	Beginning of chill.		14.	10.2	
					12 P. M.	105°	3000	. . . . .				
				Aug. 25.	1 A. M.	104.9°	1280	. . . . . .				
					2 A. M.	104.7°	6750	. . . . . .	74.6	7.5	17.4	.5
					3 A. M.	103.9°	4500	Sweating.				
					4 A. M.	103.2°	3250	. . . . . .		45.	16.	.2
					5 A. M.	102.4°	3500	. . . . . .				
					6 A. M.	101.1°	3000	. . . . . .				
					8 A. M.	98.4°	2000	. . . . . .	70.2°		5.	
6.	B.—Male, 20. White.	August 25, 1893. Illness began August 20, 1893. Daily paroxysms.	Tertian (double).	Aug. 26.	8 A. M.	98°	6000	Just before chill.	60.9	22.1		.8
					2 P. M.	105°	8250	. . . . . .	71.		14.1	1.1
					6 P. M.	99°	4100	Sweating.	61.3		22.6	.4
				Aug. 27.	8 A. M.	98.6°	2000	. . . . . .	70.1		29.2	.9
7.	P.—Male, 19. White.	August 28, 1893. Illness began August 25, 1893. Daily paroxysms.	Tertian (double).	Aug. 29.	10 P. M.	97.8°	5000	Just before chill.	70.6	14.5	13.8	.1
					12 P. M.	104.2°	6666	. . . . . .	84.6	6.4	11.1	.9
				Aug. 30.	12 M.	97°	2400	. . . . . .	61.4	17.4		2.
8.	W.—Male, 27. White.	March 6, 1894. Illness began March 4, 1894. Daily paroxysms.	Tertian (double).	March 6.	1.15 P. M.	103°	5000	Beginning of chill.	73.2	8.	18.8	.0
					4.15 P. M.	105°	6250	. . . . .	84.6	6.9	12.6	
				March 7.	8.30 A. M.	97.9°	1500	. . . . . .	43.2	26.	30.4	.4
				March 8.	9 A. M.	98°	3100	. . . . . .	48.8	27.2	13.	
				March 9.	11 A. M.	98.6°	5750	. . . . . .	60.8	30.1	8.9	
				March 10.	11.30 A. M.	98.6°	5200	. . . . . .	74.1	20.9	4.4	.5
9.	G.—Male, 22. White.	August 14, 1894. Illness began August 9, 1894. Daily paroxysms.	Tertian (double).	Aug. 15.	3.30 P. M.	100°	3500	Beginning of chill.	73.8	14.	12.1	1.1
					10 P. M.	101°	1500	. . . . . .	84.1		21.	.8
				Aug. 16.	8 A. M.	98°	5000	. . . . . .	55.2	21.3	23.3	
					2.30 P. M.	98°	3000	Just before chill.	51.6		19.1	.4
10.	J.—Male, 48. Black.	August 14, 1894. Illness began August 6, 1894. Daily paroxysms.	Tertian (double).	Aug. 16.	12 M.	98.6°	5100	. . . . . .	50.2		29.	1.1
				Aug. 17.	2 P. M.	101°	7000	Beginning of chill.	81.5	8.	10.	.5
					5.30 P. M.	100.6°	5750	Sweating.		9.1	17.1	1.
					10 P. M.	98°	2500	. . . . . .			28.	.5
11.	B.—Female, 13. White.	August 24, 1893. Illness began August 14, 1893. Irregular fever since that date.	Æstivo-autumnal.	Aug. 27. Aug. 28.	8 P. M.	103.2°	4500	Temperature not recorded since admission.		27.6		.0
					8 P. M.	101.7°	2200				2.5	
				Aug. 30.	8 P. M.	98.2°	3500	First normal temperature.	64.1	7.1	29.6	
12.	T.—Male, 8. White.	September 2, 1893. Illness began August 12, 1893. Irregular fever since that date.	Æstivo-autumnal.	Sept. 3.	10 A. M.	99.8°	6100	Irregular fever . . .	54.1	22.		.1
					6 P. M.	102°	4200	touching normal for . . .	68.2	18.	11.3	1.5
				Sept. 4.	4 P. M.	104.6°	5200	i. e., until the 5th.	48.1		31.4	.4
				Sept. 5.	8 A. M.	99.2°	6500	. . . . . .		19.9	13.6	1.
13.	C.—Male, 30. Black.	September 11, 1893. Illness began September 6, 1893. Irregular fever with night sweats.	Æstivo-autumnal.	Sept. 11.	4 P. M.	105°	6400	Height of febrile paroxysm lasting 24 hours.			11.2	.0
				Sept. 12.	8 A. M.	98.8°	3500					3.1
					6 P. M.	98.6	4000	. . . . . .				.5
14.	C.—Male, 27. White.	September 16, 1893. Illness began August 7, 1893. Irregular febrile paroxysms with sweating.	Æstivo-autumnal.	Sept. 17.	8 A. M.	98.6°		Height of paroxysm lasting 20 hours.			12.7	1.4
					8 P. M.	101.4°						.6
				Sept. 18.	12 M.				59.			
15.	M.—Male, 26. White.	August 16, 1894. Illness began August 12, 1894. Irregular febrile paroxysms with chills and sweating.	Æstivo-autumnal.	Aug. 16.	3.30 P. M.	101°		Temp. falling.		11.1	16.2	1.1
				Aug. 17.	10 A. M.	99°	6550	Temp. began to rise at 7 P. M.		23.		1.
					8 P. M.	100.7°	4500					1.2
16.	K.—Male, 12. White.	July 19, 1894. Previous history not obtainable.	Quartan.	July 21.	8 A. M.	98.4	5500	Height of febrile paroxysm.	81	17.8	18.6	.4
					8 P. M.	100.5	5400				16.1	
				July 22.	8 A. M.	98.6	3500					

and until proof to the contrary be offered, we are justified in thinking it to take place regularly. The relative numerical proportion of the various forms of leucocytes is stated by Ehrlich to be as follows:

Polynuclears, 70 to 75 per cent; lymphocytes, 15 to 25 per cent; mononuclear and transitional forms, 6 per cent, and eosinophiles, 1 to 5 per cent.

Uskow gives it as follows: Lymphocytes and small mononuclears, 18 per cent; transparent and transitional forms, 6 per cent, and polynuclears and eosinophiles, 76 per cent. The two classifications practically correspond, and we will adopt the latter as our standard.

Taking up first the polynuclear leucocytes, it is seen that they are markedly diminished, both relatively and absolutely. In one case (No. 8) they are as low as 43.2 per cent. The greatest reduction is, as a rule, at the end of the paroxysm. In six cases there is a distinct increase in their number during the first three hours of the paroxysm, corresponding to the increase in number of the leucocytes as a whole. The small mononuclear elements vary widely, from 30.1 per cent in Case 8 to 6.4 per cent in Case 7. Nothing definite is to be made out concerning the variations in their percentage.

The large mononuclear elements are, as a rule, greatly increased, both absolutely and relatively. The highest count is 33.2 per cent in Case 2; the lowest, 4.2 per cent in Case 8. They are above normal in all but two instances, and seem to reach their maximum towards the end of the paroxysm, thus counterbalancing the polynuclear forms, which reach their minimum at that time. The percentage of eosinophiles is rather below normal, but nothing worthy of note is to be made out concerning them.

In the cases of malaria of the fall type it is impossible to arrive at as definite conclusions as in the tertian cases. The onset of the paroxysm is almost always gradual, the temperature rising and falling relatively slowly as compared to the temperature in the tertian cases. The paroxysms average about 36 hours in length. It seems, however, from our cases that there is a distinct though slight diminution in number of the leucocytes at the end of the paroxysm, the reparation in number of the leucocytes taking place during the interval. The polynuclear elements are distinctly decreased in number, while there is a corresponding increase in the number of the large mononuclear elements. The small mononuclears and the eosinophiles seem relatively unaffected.

In the one case of quartan malaria which came under observation, no variations in number of the leucocytes could be made out. The differential count of the leucocytes, however, showed the same condition of affairs already noted in the tertian and fall cases.

Besides the observations here reported, a sufficient number of extra counts were made to bring the total number of counts up to one hundred, the average result being 4323. So that if we take 7000 per cmm. as the average normal number of leucocytes in human blood, in malarial fever there is on an average a diminution of about 38 per cent.

This is possibly to be explained as Bastianelli says, by the necrosis of the phagocytic leucocytes which have taken up altered blood pigment, malarial organisms and degenerated red blood corpuscles. At any rate the diminution in number of the leucocytes does occur, whatever may be the cause.

The average numerical proportions of the various forms of leucocytes in the 16 cases are as follows:

Polynuclears.	Small Mononuclears.	Large Mononuclears.	Eosinophiles.
65.04 per ct.	16.9 per cent.	16.9 per cent.	0.96 per cent.

The increase in the number of the polynuclear forms just after the chill is to be explained possibly as a manifestation of chemotaxis due to toxines circulating in the blood, or as an evidence of regeneration.

The confusion of typhoid with malarial fever, especially the fall type of the latter, is something that we must be on our guard against. In the latter form of malarial fever the temperature is often elevated for days, the patient is dull and listless, the tongue is heavily coated, the spleen is readily palpable, and Ehrlich's diazo-reaction occurs in the urine. In short, with the exception of the absence of the diarrhœa and rose-spots, there is a tolerably complete picture of typhoid fever. In Cases 11 and 12 the temperature remained elevated for four and three days respectively. The organisms of this type of malarial fever are very easily overlooked. For the first week or so after the beginning of the illness the only forms of organism present in the peripheral circulation are the so-called "hyaline" bodies. These are very small, and to one unaccustomed to examining malarial blood are readily confused with vacuoles in the red corpuscles. The crescentic forms of the organism do not appear until later in the disease, and the segmenting forms are not found in the peripheral circulation.

Uskow has called attention to the fact that in typhoid fever there is no leucocytosis, and that there is a diminution in the percentage of the polynuclear leucocytes with a corresponding increase in the percentage of the large mononuclear forms. This he believes to occur regularly in uncomplicated cases of typhoid fever, and his statement has been verified by a number of counts made by Dr. W. S. Thayer and myself at the Johns Hopkins Hospital. But this condition of the blood is exactly the same as the one which obtains in malarial fever of the fall or æstivo-autumnal type. So that the estimation of the number of leucocytes, and the determination of the proportions of the various forms by means of stained specimens, are not sufficient for the diagnosis of typhoid unless we can definitely rule out the presence of malarial organisms.

In conclusion, a few words may be added about the leucocytes in malarial anæmia.

While the occurrence of a leucocytosis in most secondary anæmias is the rule, it is never very marked, rarely being above 15 to 18,000. In four cases of malarial anæmia which we have had under observation the increase in the number of leucocytes was striking. In two cases where the red corpuscles ranged just above 3,000,000 per cmm. the leucocytes were 28,000 and 30,000 respectively. In another case the red corpuscles were just under 2,000,000, while the leucocytes reached 40,000. In the fourth case the red corpuscles were 3,600,000, a relatively mild anæmia, while the leucocytes ranged above 20,000 for a week. In all four cases the increase was solely in the polynuclear leucocytes.

ON THE PRESENCE OF IRON IN THE GRANULES OF THE EOSINOPHILE-LEUCOCYTES.

By Lewellys F. Barker, M. B., *Associate in Anatomy, Johns Hopkins University.*

A short time ago, while making some experiments concerning the metabolism of the parasites of malaria, I treated a number of smeared cover-slip preparations of blood taken from patients suffering from the disease, with reagents used for the micro-chemical demonstration of iron.

Among other tests, the delicate method elaborated by Macallum* of Toronto, for the demonstration of iron in chromatin, was employed. Dr. Macallum has found that by treating freshly teased cells from various tissues, both animal and vegetable, with a mixture of recently prepared ammonium sulphide and glycerine, and leaving the preparation on a glass-slide under a cover-glass in the thermostat at 60° C. for some days, that the chromatin of the cell-nuclei assumes a distinct green or greenish-black tinge, indicating the presence of iron. He was able to demonstrate, too, in his experiments on the absorption of iron† in certain animals, the presence of that metal in the epithelial cells of the intestine and within the protoplasm of many leucocytes, especially at the beginning of the central lacteals in the villi. Iron, not demonstrable by the ordinary micro-chemical reactions, ("masked iron"), could easily be rendered apparent by the prolonged action of the heated sulphide and glycerine, especially if teased preparations were used so that the reagent could surround on all sides the cells to be acted upon.

In my experiments, cover-glass preparations, such as are employed for the color-analysis of the leucocytes according to the methods of Ehrlich, were heated on the copper bar at a temperature of 120° C. for from one to two hours, and were then treated in the following way: A drop of solution of ammonium sulphide, prepared just before using, was placed upon the smeared surface of the cover-slip, and this was immediately laid upon a drop of glycerine, the glycerine and sulphide-solution mixing, upon a large thick glass-slide. The preparation was then placed in the thermostat at 60° C. Once as early as after 6 hours, but usually at the end of 24 hours, and more markedly at the end of 48 hours, the greenish-black iron reaction in the chromatin of the nuclei of the white corpuscles was apparent in the specimens. By this time the hæmoglobin of the red corpuscles had assumed only a slight greenish tint. In an occasional leucocyte, however, granules of the size and shape of the eosinophile granules were very distinctly stained yellowish-green.

To make sure that the granules were really those of the eosinophile-leucocytes (although the morphology of these granules is in itself so typical that they can as a rule be recognized in fresh unstained specimens of blood), some cover-slip preparations known by control-studies of slides stained with the triple stain to contain a much larger number of eosinophile-leucocytes than normal, were submitted to the same test. In these too the eosinophile granules stained sharply. The blood taken from a patient whose blood contained 18 per cent. of eosinophiles yielded very striking pictures.

The granules in the sulphide-glycerine preparations do not assume quite the same tint as do the nuclei of the leucocytes: the latter are stained greenish-black and have a dull appearance; the eosinophile granules by contrast are more highly refractive, and while stained greenish-black show also a slight yellowish tint.

The finer neutrophilic granules within the protoplasm of the leucocytes with polymorphous nuclei do not yield any visible iron-reaction.

Sherrington in his article* on the changes in the leucocytes, in certain inflammations, describes carefully the various forms of white corpuscles, including the eosinophiles (coarsely granular leucocytes). He did not notice any marked alteration in the coarse granules on treatment with ammonium-sulphide (p. 200), probably because the specimens were not submitted to the high temperature necessary for the demonstration of "masked" iron. Sherrington found, however, that with the ammonium-molybdate test as applied in micro-chemical work by Lilienfeld and Monti, that the eosinophile granules yielded a distinct though faint reaction for phosphorus. He also convinced himself of the presence of a basophilic membrane surrounding the eosinophilic (oxyphile) granules.

The significance of the leucocytic granulations is as yet not fully understood. An attempt has been made to assign to the eosinophile granules a definite function in protecting the organism against bacterial invasion. It may be that the results of the micro-chemical tests above referred to will be of some aid in coming to a conclusion regarding their import.

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* Macallum, A. B., On the demonstration of the presence of iron in chromatin by micro-chemical methods. Proc. Roy. Soc., Vol. 50.
† Journal of Physiology, Vol. XVI. Nos. 3 and 4.

* Proc. Roy. Soc., Vol. LV, No. 2, pp. 161

ON THE VALUE OF REPEATEDLY WASHING OUT THE STOMACH AT SHORT INTERVALS IN CASES OF OPIUM OR MORPHINE POISONING.

BY L. P. HAMBURGER.

(From the Pharmacological Laboratory of the Johns Hopkins University.)

Among the many researches that have been made on the physiological, therapeutical and toxicological properties of morphine since its isolation by Sertürner in 1817, those of Marmé,[*] Leineweber,[†] Alt,[‡] and Tauber,[§] demonstrating its elimination by the gastric mucous membrane take a leading place. The medical profession in general does not seem, however, to be familiar with the practical applications that may be made of this discovery and it is worth while to record the following case of opium-poisoning in which a chemical examination was made of the urine and of successive stomach washings, especially since the results agree with those found by the above-mentioned investigators in their experiments on animals.

On the evening of May 2, 1894, 660 cc. of a sherry-red fluid was sent from the hospital to the pharmacological laboratory, the liquid being part of the washings of the stomach of a Chinaman, Lee Hee, who had attempted suicide.

A report was requested as to the kind of poison that had been taken. The fluid was clear, with a few bits of orange pulp floating in it, and it smelled faintly of crude opium; it was filtered and gave the characteristic meconic acid reaction, namely, the red color with ferric chloride or ferrous sulphate which persisted on the addition of hydrochloric acid and also when boiled. A second portion of the filtered fluid was made alkaline with sodium hydrate, shaken up with ether, the ether removed and evaporated, the yellowish-white residue from the ether dissolved in a little acidulated water and this solution examined for alkaloids. It responded perfectly to the following reagents: platinic choloride, iodine in potassium iodide solution, sodium molybdate in sulphuric acid (Fröhde), potassium-bismuth iodide and potassium-mercuric iodide. The presence of meconic acid and of alkaloids being demonstrated, it became evident that we were dealing with poisoning by opium.

Lee Hee is supposed to have taken the opium at about 10 a. m., and the quantity taken we estimated to be at least ten grams, judging from the amount that still remained in the little jar which was known to have been full when the suicide was attempted.

About half-past five Lee Hee was brought into one of Prof. Osler's wards in a comatose condition and it was evident from the state of his respiration and circulation that he was not likely to recover. At this time the stomach was first washed out and the process was repeated until the physicians in charge had reason to think that there was no longer any opium in the stomach. A second lavage was made at 8 p. m., and a third at half-past eleven, a quarter of an hour before death. The fluid secured in these last two washings was colorless and from this fact it may be concluded that all the crude opium had been removed by the first washing, though unfortunately this conclusion could not receive positive proof, since the last portion of the first washing was not kept separate from the rest and chemically examined. All three washings were examined for opium and morphine and the results, which will presently be given, at least demonstrate the practical value of repeated stomach washings, even after all ordinary signs of opium, such as color and odor, are no longer found.

At 6 p. m., 75 cc. of urine was removed by the catheter and submitted to a chemical examination by Landsberg's method for the detection of morphine in the urine.[*] The residue finally obtained was a mixture of urea and morphine. No difficulty was experienced in identifying the former, it appeared in the characteristic four-sided prisms with pyramidal ends. In addition to these crystals of urea there were seen numerous very small rhombic prisms. Whether the latter were certainly crystals of morphine was not determined; nevertheless the chemical tests demonstrated the presence of morphine in considerable amount. This difficulty in separating morphine from urea is not peculiar to this case,[†] but is due to the fact that both behave toward solvents in much the same way. Control tests showed that urea does not interfere with the following morphine reactions. A minute quantity of the residue dissolved in water and treated on a porcelain dish with a drop of ammonium molybdate, gave a yellow precipitate, and the addition of a drop or two of concentrated sulphuric acid caused that beautiful play of colors, violet, blue and green, which solutions of morphine give under the same conditions (Fröhde). A fragment of iodic acid added to the diluted residue was reduced and the free iodine recognized by shaking with chloroform. In this way the presence of morphine in the urine was demonstrated. In the present case, therefore, there was no difficulty in proving the elimination of at least a part of the ingested alkaloid through the urine. Yet there is probably no point in the physiological history of morphine which has given rise to more controversy than its presence or absence in this excretion. The controversy involves not only the immediate experimental results but the more general problem of the fate of morphine in the body. Thus, some observers after demonstrating that the alkaloid was present in the urine claimed that it passed through the body unchanged; others, failing to find it, argued that it suffered a destructive oxidation and could not be demonstrated as mor-

phine in the urine. But it is now generally admitted that after large doses of the alkaloid a small quantity appears in the urine.

It is in the stomach, however, that the elimination of morphine proceeds most actively. The practical importance of this gastric excretion will be evident upon considering the results of the stomach washings in the present case.

Of these there were three as already mentioned. The first was the sherry-red fluid giving meconic acid reactions, and upon treatment by the method of Stas, alkaloidal reactions. This fluid was treated like the urine and a similar brown residue was obtained. This residue was dissolved in water, acidulated with hydrochloric acid and again evaporated. During this evaporation a white precipitate separated out which upon examination was found to be calcium phosphate, one of the inorganic constituents of opium. Having removed this salt, the residue was dissolved in warm absolute alcohol and allowed to evaporate spontaneously. Morphine crystals of a definite type were not obtained, but the solution gave beautiful morphine reactions; reducing iodic acid, responding to Fröhde's reagent, and giving a pink color with sulphuric and nitric acids (Husemann).

As already stated, it was believed that all the opium was removed during the first washing, and the fact that the second washing came out colorless seems to confirm this view. Nevertheless the latter liquid gave fine alkaloidal reactions, but did not respond to the tests for meconic acid. In other words, at the first washing the ingested but unabsorbed opium was removed; between this first lavage and the second the alkaloids had accumulated again. How? It could only have been through an excretion by the gastric mucous membrane. Nor did the elimination of the poison stop at this period; for, the third washing made several hours later, colorless also, still gave good reactions.

The meaning of these results must be clear. They point to the excretion of the alkaloids of opium by the mucous membrane of the stomach and suggest a practical application of this fact. If, as has been shown, these alkaloids, and morphine in particular, are excreted into the stomach, then washing this viscus repeatedly and at very short intervals to remove the alkaloids as fast as they are eliminated, must certainly be a life-saving process whether the poison has been taken by mouth or hypodermically. Poisoning by the latter method

has not, as far as can be ascertained, been treated in this manner in spite of Alt's demonstration of the presence of morphine in the stomach washings of men who had received 3 cg. of the hydrochlorate subcutaneously. The quantity of the alkaloid capable of being removed by repeated washings has been estimated at almost one-half. Tauber also recovered 41.3 per cent. from the faeces of dogs to whom morphine was administered subcutaneously but where the stomach had not been washed out. Alt has ascertained that for dogs, doses of more than 10–12 cg. morphine pro kilo may be considered lethal; 17 cg. pro kilo almost invariably caused death. On the other hand, if, immediately after the injection, the stomach was washed and the lavage continued for forty-five minutes, then 10–12 cg. pro kilo never produced serious symptoms, and indeed with 17 cg. and even 20 cg. pro kilo the symptoms of poisoning were not so severe as when 12 cg. were administered without repeated washing. Two dogs were saved after the injection of so large a quantity as 24 cg. pro kilo. This evidence goes to prove that the excreted morphine is reabsorbed and that it still has toxic properties; and may not the frequent relapses following apparent recoveries from overdoses of morphine[*] also furnish proof of such reabsorption? By a continuous lavage the exchange that goes on between the gastro-intestinal mucous membrane and the general system would be interrupted, and in proportion as the alkaloids excreted by the mucous membrane are removed the effects of their reabsorption would be avoided. Conformably to the results of Alt's experiments, the lavage should be repeated at short intervals, and the sooner this can be done after the opium or morphine has been taken, the better. In the case cited in this paper no successful outcome could be anticipated, because too long a time elapsed between the taking of the opium and the beginning of the treatment.

In connection with this subject it may be well to repeat Kobert's[†] suggestion, that a chemical examination of the faeces should be made in cases where the morphine habit is suspected but is denied by the patient, and where for various reasons it is difficult to secure conclusive evidence of the fact in other ways.

[*] See for example, Souchon: "On relapses following recoveries from overdoses of injections of morphine." N [...] M [...] [...], N.Y., pp. 437–39, 1886–87; Taylor: "Lancet," Vol. i, p. [...] 1881.
[†] Lehrbuch der Intoxikationen, p. 561.

DEATH OF JAMES CAREY, TRUSTEE OF THE JOHNS HOPKINS HOSPITAL.

The Trustees of the Johns Hopkins Hospital, having learned with deep sorrow of the sudden death of JAMES CAREY, one of its most faithful and conscientious members, desire to put upon permanent record their appreciation of his character and services. He was the soul of integrity and uprightness in every relation in life. His heart was full of sympathy for the sick, the sorrowing and the unfortunate. It can be said of him that he wronged no man in thought, word or deed, but was kind and helpful to all. He had no enemies, but many friends. He loved children, and was tender and gentle with

them to a remarkable degree. He took great interest in the Johns Hopkins Colored Orphan Asylum and was anxious to develop a better work in its new buildings to [...] of [...] tion. At the last meeting of the Trustees he indicated he was in full sympathy with some plans for the care and training of colored orphans. He was also peculiarly interested in all the humanitarian aims and work of the Hospital, and his sound judgment and wise counsel commanded the highest respect of his associates. After a pure life, full of good deeds and kindly impulses, he has gone to his reward.

THE BACILLUS OF THE PLAGUE.*

ABSTRACT OF REPORT TO THE JOURNAL CLUB OF THE JOHNS HOPKINS HOSPITAL.

The epidemic of the black plague which broke out in May last in Hong-Kong and was very destructive to the Chinese population, will be made memorable in the history of modern medicine on account of the simultaneous discovery by a French and a Japanese investigator of the micro-organism which there is reason to believe is the cause of the disease. These two investigators, who are already well known to the scientific world through their important previous contributions to the literature of bacteriology, are Drs. Yersin and Kitasato.

The former, Dr. Yersin, who was sent by the French government, owing to the danger to their Indo-Chinese possessions, with instructions to study the nature of the plague, the conditions under which it is propagated, and to search for more effective means for preventing the invasion of their possessions, arrived in Hong-Kong on June 15th.

Dr. Kitasato, accompanied by Dr. Aoyama, was sent by the Japanese government, and arrived at Hong-Kong on June 12th. Dr. Aoyama was delegated to study the clinical and pathological features of the disease, whereas Dr. Kitasato was to undertake the investigation into its ætiology. Dr. Aoyama became infected with the disease, but recovered. Hence the report of their investigations relates quite exclusively to the bacteriology of the disease.

On June 14th the first autopsy was conducted by Dr. Aoyama, and the blood and organs were studied for micro-organisms by Dr. Kitasato, who at the same time made cultures. Under the microscope bacilli were found in the cover-slips, but as the individual had been dead 11 hours the result was not considered conclusive. However, guinea-pigs were inoculated with a bit of the spleen and the blood from the case.

On the same day, in the blood taken from the tip of the finger of patients sick of the disease, bacilli agreeing in form with those found at the autopsy were again met with. The next day (June 15th) the blood-serum cultures made from the autopsy of the previous day showed upon examination a growth of micro-organisms which resembled the bacilli already seen. From these cultures a guinea-pig, mouse, rabbit and pigeon were inoculated.

The guinea-pigs inoculated from the spleen and the blood of the patient dead of the disease, were dead on the second day, and the autopsy upon these animals showed œdema at the seat

of inoculation, and the bacilli were recovered from the viscera of the animals. Of the animals inoculated with the growth from the serum-cultures, all died, in from 1 to 4 days, according to the size of the animal, excepting the pigeon. The latter survived. The post-mortem examinations of these animals confirmed the conditions observed in the first experimental guinea-pigs.

Kitasato found the blood of human beings, dead of the plague, to contain the bacilli often in such small numbers that in many preparations perhaps not more than 2 or 3 organisms could be found; while the lymph glands, spleen, liver, lungs, brain and intestines always showed many bacilli, which could be cultivated. At times in cover-slips made from the inguinal glands and spleen the number of organisms was so great as to suggest that they had been made from a culture. In all the inoculations from the organs a single organism in pure culture was invariably obtained.

The characters of the bacillus.—The micro-organism obtained in all instances consists of short rods, with rounded ends, resembling the bacillus of chicken cholera, and possessing a capsule. This capsule is at times quite distinctly marked, at others it is difficult to see. The bacillus stains in aniline dyes, the ends staining mor deeply than the middle portion. According to Yersin it is decolorized by Gram's staining method. It is described by Kitasato as being very motile.

Upon blood-serum, after 24 to 48 hours, at the body temperature, the bacillus grows abundantly, the growth appearing moist and of a yellowish-gray color. No liquefaction of the blood-serum occurs. It also grows upon agar, but better upon glycerine-agar, forming a grayish-white surface growth. The colonies in agar plates show a bluish translucence. They are round, or present slightly irregular contours, and are moist in texture. The young colonies are glass-like in appearance, but in the older ones the central part becomes thicker and more opaque. In bouillon, according to Kitasato, a cloud is produced, whereas Yersin compares the growth in this medium with the appearance produced by the streptococcus erysipelatos, namely, the formation of small granules which settle upon the sides and to the bottom of the test-tube. Stab cultures show after 1 to 2 days a fine dust-like line of growth. The bacillus does not grow on potato, in 10 days, at the ordinary temperature, but after two days at the temperature of 37.5° C. a growth, gray in color and with a dry surface, was observed. The mean temperature of Hong-Kong was too high to permit of gelatine being used.

The most favorable temperature for the growth of the bacillus seems to be from 36° C. to 39° C. According to Kitasato, it does not form spores. Cover-slip preparations from young agar-agar cultures show forms resembling chains of cocci, but older ones present distinct bacillary forms.

Effects upon animals.—The animals used for experiments were those previously mentioned, namely, rabbits, guinea-pigs, rats, mice and pigeons, and in Kitasato's experiments, sheep. With the exception of pigeons, all these animals proved to be

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* The importance of the discovery of the micro-organism believed to be the cause of the plague seems to justify the publication of abstracts of the two original papers which have just appeared on the subject. Moreover, as one of them (Kitasato's) appeared originally in Japanese and is therefore relatively inaccessible to English readers, it seems less necessary to apologize for presenting the results together at this time. This it would have been impossible for me to do but for the kindness of Dr. S. H. Sanobe, now attending upon the post-graduate courses at the Johns Hopkins Hospital, who kindly read the Japanese paper to me. The two papers are to be found in the Sei-i-Kwoi (Medical Journal), Tōkyo, for Sept. 8, 1894, and Le Bulletin Médical, Sept. 23, 1894. In the latter a French abstract of the report of Dr. Kitasato is also given. — Simon Flexner.

susceptible. The symptoms of the disease developed in the inoculated animals from the first to the fourth day, depending upon the size of the animals. According to Kitasato, the animals are uniformly small at Hong-Kong, the average weight of guinea-pigs being 115, and of rabbits 200 to 250 grams.

The first effects of the subcutaneous inoculation were already perceptible in Yersin's cases after a few hours. The seat of inoculation became œdematous, and the adjacent lymph-glands could be felt. After 24 hours the animal is quiet, the hair is rumpled, tears run from the eyes, later convulsions set in which usually continue until death occurs. At the seat of inoculation there is hemorrhagic œdema, the lymph-glands are swollen, the intestine is sometimes hyperæmic, the adrenal glands congested, the kidneys purple, the liver large and congested, and the spleen is much enlarged, showing, at times, according to Yersin, an eruption of miliary tubercle-like nodules. The bacilli can be recovered from the organs of the experimental animals.

In this connection it is interesting to note that in the part of the city where the disease prevailed many rats were found lying dead upon the ground and in the houses of these animals; and it is stated by Yersin that in the epidemics of Pakhoi and of Lien-Chu, in the province of Canton, it had been observed that before the plague attacked human beings it raged with great intensity among mice, rats and swine.

Habitat of the bacillus.—It has already been mentioned that the blood and organs of human beings and experimental animals dead of the plague contain the bacillus. The same organism has been obtained from the rats found dead in the infected district, and Yersin having observed that the flies which infested the laboratory in which his autopsies on experimental animals had been conducted were dying in large numbers, found on making cultures from one that it contained the organism. Kitasato inoculated three guinea-pigs with the dust derived from the room in which there was a case of the plague. Of these two died of tetanus; the remaining one died with the symptoms of the plague, and the bacillus was obtained from the internal organs. Yersin obtained earth at a distance of 4 to 5 centimeters below the surface from the soil of an infected house. From this cultures were made, and bacilli having the cultural properties and the form of the plague bacillus were isolated. These were, however, devoid of virulence.

Yersin pointed out in a previous part of his paper that in cultures from the glands or the blood the colonies grow with different degrees of rapidity, and the more rapidly growing ones are less virulent than the slower ones. Thus the growth derived from a particular colony might kill guinea-pigs after a longer period of incubation, or not at all, and yet be fatal to mice. He also obtained from a gland which had been removed in the third week of the disease, a culture of the organism which was destitute of pathogenic properties, even for mice.

Healthy mice placed in the same cage with inoculated mice succumb to the disease, although later than the infected ones; and susceptible animals fed with food containing the bacillus may die and present the characteristic lesions.

Action of physical and chemical agents on the vitality of the bacillus.—These experiments were conducted by Kitasato.

a) *Physical.*—1st. Drying. Cover-slips were made from the infected lymph-gland, and exposed in a room having a temperature of 28° to 30° C., being protected from sunlight. These were dropped into bouillon at varying periods. Those exposed from 1 to 36 hours gave a growth when kept in the thermostat for two days, while cover-slips which had been exposed for four days gave no growth in bouillon at the end of seven days in the thermostat.—2d. Sunlight. Cover-slips prepared in the described manner failed to give any growth whatever after an exposure to the direct rays of the sun for 3 to 4 hours. The experiments were repeated with a pure culture of the bacillus made upon blood-serum with the same results.—3d. Heat. Bouillon-cultures were killed in ½ hour at 80° C. In steam at 100° C. all the organisms were killed in a few minutes.

b) *Chemical.*—1st. Carbolic acid. Three-day old bouillon cultures were treated with quantities of carbolic acid equaling 0.5 per cent., 0.75 per cent. and 1.0 per cent. of their volume. From these mixtures inoculations were made into fresh bouillon every few minutes.

0.5 per cent. carbolic acid. After one hour's contact at room temperature, a growth in two days at temperature of the thermostat.

0.75 per cent. carbolic acid. Same result.

1.0 per cent. carbolic acid. After one hour's contact no growth in one week at 37.5° C.

0.5 per cent. carbolic acid. After two hours' contact at room temperature, no growth in one week at 37.5° C.

2nd. Milk of lime. The same plan was pursued, using the solutions of the same strength.

0.5 per cent. milk of lime. After 2 hours' contact a very slight growth.

0.5 per cent. milk of lime. After 3 hours' contact no growth.

1.0 per cent. milk of lime. After 2 hours' contact no growth.

Symptoms of the disease.—The disease comes on suddenly after an incubation period of 3 to 6 days. There is great lassitude and prostration. The temperature rises, and delirium may be present. In 75 per cent. of the cases the glands of the groin become swollen, in 10 per cent. those of the axilla, and rarely those of the neck and other regions. The tongue is heavily coated and black in color. Vomiting and diarrhœa may occur, and are considered as being very unfavorable. Death may occur in 48 hours, and frequently it takes place sooner. Should the patient live until the 5th or 6th day the prognosis is better. The enlarged glands may go on to suppuration and the abscesses so formed heal very slowly. The disease attacks males and females, the old and the young. The mortality in this epidemic is given by Kitasato as 75 to 85 per cent., by Yersin as 95 per cent.

Kitasato examined the blood of 21 cases. 13 of which gave positive results. Of the remaining five, two were proven not to have the disease; the remaining three were doubtful. The organisms are difficult to see in a cover-slip from the blood; it is therefore necessary to make cultures.

The conclusions which are reached by Dr. Kitasato's report are as follows:

1. In the plague, bacilli are found in the blood, glands and viscera.

2. This particular bacillus is not found in any other disease.

3. Obtained in pure culture it is capable of producing in inoculated animals the same effects as in human beings.

4. It gains entrance into the body through (a) the respiratory tract, (b) excoriations of the surface, (c) the digestive tract.

5. The disease prevails especially under faulty hygienic conditions; it is therefore urged that general hygienic measures be carried out. Proper receptacles for sewage should be provided; a pure water supply afforded; houses and streams are to be cleansed; all persons sick of the disease isolated; the furniture of the sick washed with a 2-per cent. carbolic acid solution in milk of lime; old clothes and bedding are to be steamed at 100° C. for at least 1 hour, or exposed for a few hours to sunlight. If feasible, all infected articles should be burned. The evacuations of the sick are to be mixed with milk of lime; and those who die of the disease are to be buried at a depth of 3 metres, or, preferably, cremated. After recovery the patient is to be kept in isolation at least one month. In one case he was able to demonstrate bacilli in the blood after the third week. All contact with the sick is to be avoided, and great care is to be exercised with reference to food and drink.

PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS HOSPITAL MEDICAL SOCIETY.

Meeting of May 7, 1894 (continued).

DR. KELLY in the Chair.

Report of Twelve Cases of Complete Radical Cure of Hernia, by Halsted's method, of over two years standing. Silver wire sutures.—DR. HALSTED.

Dr. Bloodgood has very kindly written to all of the old hernia cases in town and to several living out of town, requesting them to come to show themselves to-night. It is now nearly five years that we have done this operation for the radical cure of hernia. You may remember that a little more than a year ago we reported 89 cases of hernia, and that there were no recurrences in the cases of union by first intention. In 6 cases there was more or less of a recurrence, but all of these cases had suppurated for some reason or other, and had healed by granulation. It remains to be seen whether or not there are any returns amongst the cases here to-night.

This first man was operated upon only two weeks ago to-day. In this case and other recent cases we have used silver sutures instead of silk, not because we wish anything stronger than silk, but because of the results of experiments which Dr. Bolton has kindly made for us, and which we have made, to determine the power of different metals to inhibit the growth of bacteria. This line of experimentation is not entirely original with us. Dr. Bolton has found that zinc and cadmium and copper are perhaps the best metals to inhibit the growth of organisms. Silver is perhaps the next best metal, and we are using therefore silver wire altogether, both for deep buried sutures and for the continuous buried skin sutures. This is a beautiful instance of healing by first intention.

Since my last report of a year ago we have had a great many cases of hernia, and so far there have been, we believe, no recurrences.

OLD CASES OF HERNIA EXHIBITED AT THE MEDICAL SOCIETY.

Case 1. J. B., æt. 48. Had a very large right, oblique, inguino-scrotal, reducible hernia of fifteen years standing. Operation in August, 1889 (four years and six months ago). The bladder was caught in one of the stitches, and the wound consequently was laid open and allowed to heal by granulation. The scar now is firm, depressed, 12½ cm. long, and about 1 cm. in width, there is no impulse on coughing, no change in the cord or testicles, the man suffers no inconvenience from the wound.

Case 2. F. F., æt. 7 (boy). Small, right, congenital, inguinal, reducible hernia. Operation in October, 1889 (four years and four months ago). Wound healed per primam; there is a narrow linear scar, no impulse on coughing, no change in cord or testicles, no discomfort from wound.

Case 3. H. S., æt. 37 (colored). Large, right, inguinal, reducible hernia of two years duration. Operation February, 1890 (four years ago). Healed per primam; there is a narrow linear scar 9 cm. long, firm, no impulse, the little finger can detect the opening in the muscle through which the transplanted cord passes, no inconvenience from wound, no change in cord or testicles. Patient does heavy work.

Case 4. E. P., æt. 7 (girl). Small, right, oblique, inguinal, reducible hernia of two months duration. Operation November, 1890 (three years and four months ago). Healed per primam, except a small superficial stitch abscess, the scar is white, 11 cm. long and about ¾ cm. wide, firm, no impulse, no discomfort.

Case 5. A. E., æt. 5. Small, right, oblique, inguinal, reducible hernia of four years duration. Operation by Dr. Brockway (McBurney's method) in July, 1890. The hernia recurred, and in November, 1890 (three and one-half months afterward), a second operation by Halsted's method was performed. The wound healed per primam, notwithstanding the fact that the child had whooping-cough. It is now three years and three months since the last operation, and there is no return of the hernia.

Case 6. F. S., æt. 27. Small, left oblique, inguinal, reducible hernia of two months duration, following typhoid fever. Operation February, 1891. Healing per primam, except for a small superficial stitch abscess. It is now three years since the operation. The scar is firm, white, 12 cm. long. There is no impulse on coughing. No discomfort. Testicles and cords normal.

Case 7. J. T., æt. 47. Small, right, oblique, inguinal, reducible hernia of six weeks duration. Operation February, 1891 (three years ago). Healed per primam. The scar is narrow and white, 13 cm. long, firm. No impulse on coughing. No discomfort. Testicles and cords normal.

Case 8. W. C. W., æt. 2½. Small, right, inguino-scrotal, congenital, reducible hernia. Operation July, 1891 (two years and eight months ago). Scar white, linear, 8 cm. long, firm. No impulse on coughing. No change in cord or testicle.

Case 9. G. B., æt. 22. Right, oblique, inguino-scrotal, reducible hernia, noticed at birth; wore a truss from eight to thirteen years old. Operation August, 1891 (two years and seven months ago). The scar is 13 mm. wide and 12 cm. long, white, firm. No discomfort. On coughing there is a slight impulse at the lower end of the scar just above the pubes, corresponding to the external ring. There is no return of the hernia.

Case 10. A. McI., æt. 26 (colored). Right, oblique, inguino-scrotal hernia, reducible for four years, strangulated on admission. Operation August, 1891 (two years and seven months ago). The veins were very large and excised, healing per primam, except at the upper end, in which there was superficial suppuration, November, 1893. Hydrocele and testicle, on the same side, removed

because they gave discomfort. The scar is firm, there is no impulse on coughing. No discomfort.

Case 11. J. W. B., æt. 5. Small, left, oblique, inguino-reducible hernia, following whooping-cough at four months of age. Operation September, 1891 (two years and five months ago). The wound suppurated at its upper third and healed by granulation. The scar is 2 mm. wide, it has stretched some. Is 8 cm. long and firm. No impulse on coughing. Testicle and cord normal. There had been an epididymitis following the operation, the induration from which lasted for six months.

Case 12. H. P., æt. 29. Small, right, inguinal, irreducible hernia of two years duration. Operation October, 1891 (two years and five months ago). There were no adhesions in the sac. Wound suppurated and healed by granulation. There was a stitch sinus for three months. The scar is firm, but has stretched a little. It is 11½ cm. long. The abdominal walls of this patient are so very thin that on coughing there is an impulse above Poupart's ligament on both sides. The impulse is as great on one side as on the other.

Recent Results in Hysteromyomectomy.—Dr. Kelly.

The technique of no operation in the field of gynecology has been so rapidly advanced as that of hysteromyomectomy. Until a few years ago the removal of a myomatous uterus was considered one of the most dangerous operations, and was only resorted to when the patient's life was in imminent danger from the further growth of the tumor or from the secondary results such as high grade anæmia, pressure from adjacent organs, etc.

Less than twenty years ago the first attempts at the extirpation of these myomatous uteri were made, and the mortality following these operations was so appalling as to cause all but a few to shrink from the operation.

Some ten years ago, Professor Schroeder, of Berlin, with the courage of his convictions, began with great earnestness to advocate the total extirpation of myomatous tumors, and although his attempts were followed by a very high rate of mortality he persisted, believing that better results would follow as the steps of the operation were perfected. These anticipations were not realized during his life, but in the light of the statistics of to-day his prophecy for the future is well sustained. At the present time the mortality following this operation is little if any greater than that following the average run of ovariotomies.

We now consider the operation indicated when the tumor is rapidly growing even though no uncomfortable symptoms are produced by its presence, as sooner or later, in the great majority of cases, untoward symptoms will arise which not only endanger the patient's life, but also render the operation in the presence of these complications much more difficult.

As will be seen from the analysis of 50 cases of hysteromyomectomy, made for me by Dr. Clark, there are quite a number of indications for operation.

From the standpoint of relative frequency of myoma in the white and colored race this analysis of 50 cases, while small in number, yet serves to bear out a statement made by me some months ago before the South Carolina Medical Society, that myomata were as frequent in white as in black women.

A number of those present at that meeting took exception to this remark, claiming that white women were able, being better situated financially, to come greater distances for treatment than were the impoverished colored women who, perforce of circumstances, must remain at home.

But according to the relative frequency as indicated by this table the proportion is as 6⅛ to 1, there being 43 whites to 7 blacks. Of the latter 6 appeared to be of pure African descent, the seventh was a mulatto.

While the criticism offered by these gentlemen bears a certain weight, yet from the very fact that we are in the center of a large negro population in Maryland and the adjacent States of Virginia and Delaware, the proportion should be very different from this which I present, if the statement that myomata are more frequent in the colored than in the white race is to be sustained.

The ages of the patients at time of the operation *averaged* 42.5 years, the oldest being 59 and the youngest 25 years of age.

This part of the analysis is interesting as showing the prevalence both among physicians and laity of the belief that these tumors will disappear or cease to give rise to discomfort after the menopause.

In a number of these cases the tumor had been discovered two or three years, in a few instances many years before the operation, the patients having delayed operation in the hope that the menopause would relieve them.

Although the above opinion is still held by many worthy gynecologists I give it little credence, as according to my experience, instead of decreasing in size, a number of these tumors take on their most active growth after the menopause, while in many other cases the menopause is delayed five years or longer by their presence.

Continuing the analysis further, I find that 37 of the women were married and thirteen single. Of the former, twenty-three bore fifty-six children. Seventeen miscarriages occurred among this number; one patient, however, furnishing ten of these, the remaining seven being distributed among the 22 other women.

The prevailing belief is that these women are as a rule sterile. In the great majority of these cases which I report no children had been borne after the tumor had attained a great size, but on the average the fertility of these women was little below normal.

The following data relating to the menstrual flow bear out the usual statement, namely, that there is deranged menstruation, usually tending to profuse and irregular flow. Of the 50 cases, 9 were normal as to menstrual function; in 35 the flow was excessive, often inclined to free or profuse hemorrhage; while 5 had passed the climacteric.

The major indications for operation were increasing size of tumor, secondary anæmia from persistent or profuse hemorrhage, and pressure symptoms; of the 50 cases, 30 presenting this group of symptoms. In two cases excessive hemorrhage alone was the indication; in four, rapidly increasing size of tumor, although accompanied by no unpleasant symptoms; in five, severe pain. Another indication is the urgent request of a patient to be relieved of her tumor. In such cases I usually advise the patient to wait a certain length of time, usually from six months to one year, and if she is then still urgent in her request I will operate. Two cases in this list were of this character. In one case there was profound mental depression, verging closely on to melancholia, caused by constantly brooding over the fact that she had "a tumor." Operation was followed promptly by complete restoration of the patient's spirits.

In one case the tumor was not detected until pregnancy was six months advanced, and then it so blocked the inferior strait as to require Caesarean section for the delivery of the child. In this case the uterus was amputated and the pedicle dropped and the abdomen closed as in the ordinary hysteromyomectomy.

Of the remaining 50, one was the subject of an intense pruritus vulvæ, from constant discharge; another, of prolapsus uteri, and a third had attacks of urinary suppression, while two had peritonitis.

Although myomatous tumors are often thought to be unaccompanied by pain, yet my analysis shows that of the fifty cases 22 complained of pain of varying intensity, from a heavy dragging sensation in the pelvis to acute pain in the region of the uterus or ovaries, often resembling "toothache." A considerable proportion referred their pains to the legs and groins, evidently due to pressure on the sacral and lumbar plexuses.

A complication not infrequent, associated with these tumors, is inflammatory disease of the appendages, varying in degree from slight adhesions to purulent salpingitis. In this list which I present one such case is found. The presence of pus necessarily renders the operation more dangerous, as the liability to infection

is very greatly increased. In a second case there was a pyometra, the pus escaping into the pelvis when the uterus was amputated. This patient, however, made an uncomplicated recovery. As a precaution against the general distribution of the pus the stump was surrounded by pads of gauze, and at the completion of the operation, before closing the abdomen, the pelvis was thoroughly irrigated with salt solution.

A few words as to the evolution of hysteromyomectomy.

The first mode of operation systematically described and generally adopted was that of Hegar.

According to his method the abdomen was opened, the tumor lifted out, a rubber ligature thrown around the pedicle, the uterus amputated, and the pedicle suspended in the abdominal wound by means of pins. The stump was dressed for two weeks or longer until it gradually separated, leaving a granulating pit in the bottom of the wound. Schroeder soon modified this method by dropping the stump, but his operations were followed by such a high rate of mortality as to prevent the general adoption of this operation.

After having followed Hegar's method in two cases, in Philadelphia, I devised a new operation, which I described as the combined extra- and intraperitoneal method. This included the best principles of Hegar's and Schroeder's methods. Hemorrhage frequently arose from the slipping of the constricting ligature in the Hegar operation. The pedicle was often large, and the encircling ligature, although controlling the hemorrhage during the operation, would subsequently slip after the disappearance of the temporary œdema, and fatal bleeding would follow. This no doubt was the cause of death in many cases.

Schroeder, as did the general surgical world, assigned his high rate of mortality to two causes—sepsis and hemorrhage.

It was accepted without question that the sepsis came from the cervical canal. I was convinced of this fact, and only conducted the first part of my operation according to the plan of Schroeder.

After amputating the tumor I carefully approximated the cervical stump, leaving the sutures long, by means of which I drew the stump up into the lower angle of the abdominal wound, and detained it there by catching the ligatures with artery forceps.

I then attached the peritoneum to the stump on all sides, and closed the abdomen down to the lower angle. Without exception these cases did well, and the wound filled in nicely with granulation tissue.

After having employed this method satisfactorily in a great many cases, I decided to drop the stump completely into the abdominal cavity as one does the pedicle of an ovarian tumor.

Since adopting this method I have performed 50 operations, with only three deaths, the latter being in no way traceable to infection from the stump.

One death was due to septic catgut, another to shock, and the third to sepsis which arose from a superficial eczematous patch in the fold of the abdomen. This patch was protected by a sealed dressing, but during the operation it became displaced. There was extensive infection of the abdominal wound in this case, the peritoneal cavity being free of pus.

Looking back at Schroeder's high rate of mortality we can arrive at but one conclusion, and that is that his antiseptic precautions were not sufficient.

I am now quite certain that a healthy cervical canal does not give rise to infection in these operations.

With regard to hemorrhage, there is little danger if the ligatures are properly placed. There are but four great channels of blood supply to these tumors, regardless of their size, be they large or small, the two ovarian and two uterine arteries.

The two ovarian arteries can be caught easily above and tied off. The accompanying veins are frequently enormously enlarged, and care must be observed not to prick them with the needle, as embarrassing hemorrhage will follow such an accident.

These vessels should be tied also on the uterine side, and cut

between the ligatures, thus preventing the blood which remains in the tumor from running down and obscuring the field of operation. Having secured this source of hemorrhage, the broad ligaments are opened, and by dissecting down between their layers with the finger the uterine arteries, the remaining sources of blood supply, are felt beneath the finger on the floor of the pelvis. If these are firmly ligated there is no necessity of throwing a provisional rubber ligature around the base of the tumor while it is being amputated.

The tumor is removed by a circular incision, the vesical peritoneum being first dissected off, as it will be used later to form a hood for the stump. The pedicle is cupped, and with three or four silk sutures of medium size (No. 2) the surfaces of the flaps are brought into apposition. The edges usually require two or three sutures to complete a snug approximation. The redundant peritoneum is then brought together with a continuous silk suture (No. 2), and the female pelvis is converted into one of the male type, all of the structures between the rectum and bladder having been removed.

From the analysis of 50 cases it will be seen that the operation for the total extirpation of myomatous uteri is eminently successful, and when a case presents any of the indications enumerated above should be operated upon.

SUMMARY OF 50 CASES OF HYSTEROMYOMECTOMY.

Age.—Youngest, 25 years; oldest, 59 years; average, 42.5 years. 29 of the 50 cases between the ages of 40 and 50.

Married.—37.

Single.—13.

Color.—6 blacks; 1 mulatto; 43 whites.

Children.—13 married were sterile; 23 married women gave birth to 56 children.

Miscarriages.—17 miscarriages occurred, one patient furnishing 10 of these, leaving only 7 to the remaining 22 married women.

Menstrual history.—Menses normal, 9 cases; menses profuse, often inclined to free or continuous hemorrhage, 36 cases; climacteric, 5 cases.

Indications for Operation.—Profuse hemorrhage, increasing size of tumor, secondary anæmia, and pressure symptoms, 30 cases; excessive hemorrhage, 2 cases; increasing size of tumor, 4 cases; pain, 5 cases; urgent request of patient, 2 cases; mental depression caused by presence of tumor, 1 case; myoma blocking inferior strait, preventing delivery of child, 1 case; suppression of urine, 1 case; intense pruritis, 1 case; prolapsus uteri, 1 case; peritonitis, 2 cases.

Of the 50 cases, 23 complained of pain, frequently quite severe, in the region of the tumor.

Drainage.—Gauze, 6 cases; no drainage, 44 cases.

Stitch-hole abscess.—4 cases.

Mortality.—6 per cent.*

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* Since reporting these cases before the Johns Hopkins Medical Society I have completed my seventieth operation without any increase in the mortality.

THE JOHNS HOPKINS HOSPITAL REPORTS.

REPORT IN GYNECOLOGY.

By HOWARD A. KELLY, M. D.,

Professor of Gynecology in the Johns Hopkins University and Gynecologist to the Johns Hopkins Hospital.

This report containing 460 pages, large octavo, and 63 plates and figures, is now ready. It includes many papers of interest and importance to gynecologists. Price $3.00. Price of Vol. 3 complete, $5.00.

NOTES ON NEW BOOKS.

Burdett's Hospital and Charities Annual, 1894 : being the Year-book of Philanthropy. Edited by HENRY C. BURDETT, Author of " Hospitals and Asylums," etc. (*London : The Scientific Press (Limited). New York : C. Scribner & Sons.*)

One hardly knows which to admire most, the patience displayed in collecting the immense store of statistical information contained in this volume of more than 500 pages, or the skill shown in marshaling and handling the facts to bring about better hospital administration. The book is a marvel of laborious compilation : how great the labor few can realize who have not had a similar task in wringing statistics from indifferent, over-worked or procrastinating public officials. Many of the statistics are of purely local interest, and many of the topics referred to have special bearing upon the English hospitals and training schools for nurses, but the book, as a whole, is profitable to hospital workers throughout the world.

Among them may be mentioned such subjects as the training of nurses in mental cases, hospitals for consumption, homes for the dying, and hospital finances. The author, with a prescience born of long experience, has touched a vital point of hospital administration in his chapter on hospital finances. As he so clearly points out, it is only by a comparison of the figures presented by each hospital that we can accurately determine what good is being accomplished and whether money is judiciously expended.

It is safe to say that those hospitals alone will endure which are able by the results attained to show a reason for their existence. The author had previously presented in another little volume, "A Uniform System of Accounts for Hospitals and Public Institutions," a scheme of classification of expenditures which in his judgment should be generally adopted, and the figures presented in the "Annual" indicate that gratifying progress has been made in securing the adoption of the scheme in England. It is very desirable that some corresponding although probably not identical scheme should be adopted in America, as the conditions of our hospitals, while varying somewhat in details, are essentially the same. In some respects they could be improved. The unit of expenditure should be one day instead of one week, for example, and the cost of maintenance should be reckoned upon the actual number *of days of hospital care given*, and not upon the *weekly cost of the average number of beds occupied* during the year. The cost of out-patients should be reckoned separately. It is interesting to note how widely the conditions of admission and support of patients differ in Great Britain and America. In twelve large hospitals in Great Britain each in-patient must provide for himself tea, butter and sugar. In three hospitals he must bring, in addition, a teacup and saucer, spoon, knife and fork, soap and towel. In fifteen hospitals he must provide a change of personal linen and pay for his own washing. In eighteen hospitals alone are in-patients freed from these extra charges, which must be a serious burden upon their friends and a prolific source of misunderstanding between nurses and patients. In such a wealth of information as is here given upon all topics connected with hospital and training school management, it is difficult to discuss any topic with any adequate fullness in this brief review. The book must be carefully examined by practical hospital workers to be fully appreciated.

Disease and Race. By JADROO. (*London : Swan Sonnenschein & Co.,* 1894.)

The object of this little book is stated to be " an endeavor to show some continuity in disease, to evolve a little order out of existing chaos." The attempt is commendable, but the success of the effort is not great. The order evolved out of existing chaos is largely theoretical and hypothetical, and tends to confuse rather than to make plain. Leprosy is first spoken of, and an effort is made to show that the leprosy of the Bible differs in many respects from leprosy as it appears to-day. Instead of reaching the obvious conclusion that the term translated by the word leprosy possibly included a variety of diseases like psoriasis, scabies and other forms of contagious disease, the author considers that true leprosy as it now appears is a hybrid disease produced by the combination of Jewish or white leprosy and some other disease which has developed in the countries bordering on the Mediterranean in modern times. This he suggests probably originally came from America, and meeting the existing form of leprosy, the two diseases produced a compound or hybrid, taking most of the effects and symptoms of each of them and continuing their course through succeeding generations as one disease, neither being to a sufficient degree either hereditary or contagious to extinguish the other by successive natural inoculations. The result has been to modify the character and especially the contagiousness of leprosy, until as now it appears considerable doubt is expressed by some authors as to its being contagious at all. He further reasons that leprosy and gonorrhœa have produced syphilis, which in turn has been modified by successive transmissions into scrofula, and finally into tuberculosis. Whooping-cough has been modified into measles, and Aleppo-button into plague, and the two latter have combined and produced small-pox. Malarial fever has been modified into miliary fever, and this has been transformed into scarlet fever, and finally into diphtheria—this is surely " a continuity in disease " which would be interesting to study if true. These conclusions are evidently based upon the fact which has long been known, that many forms of disease become modified by passing through individuals, until a severe type at the beginning of an epidemic may become a comparatively mild one at the latter point of it, and the added fact that one attack of an infectious disease often confers an immunity from subsequent attacks. Reasoning from these analogies, our author believes that diseases are so modified as to become essentially new diseases which finally find the race immune to their attacks. This, however, is pure hypothesis. As a matter of fact we have no reason to think the poison of small-pox any less severe except where the severity of the disease has been modified by vaccination. Plague and measles would probably be as severe and contagious as formerly were it not for improved sanitation and more healthful modes of living. Tuberculosis is probably more wide-spread and more fatal now than ever before. The following will serve as a good example of his reasoning :

" That the American continent was either the original home of leprosy or one of its modifications is extremely probable, by the fact of the comparative immunity of the pure-blooded aborigines from leprosy ; and this does not shut out the possibility that the disease arose and ran its course in America prior to the commencement of the disease in the Old World from a like cause." This is not unlike the old reason why syphilis was thought to have originated in America because guaiacum was found native here, and it was altogether probable that this disease and what was regarded its only infallible remedy must have been associated. The theory of hybrid diseases enunciated by the author has no countenance in modern bacteriology and cannot be accepted. The book, while interesting as a contribution to speculative medicine, is inconclusive and unsatisfactory.

The Nurse's Dictionary of Medical Terms and Nursing Treatment, compiled for the use of nurses, and containing descriptions of the principal medical and nursing terms and abbreviations, instruments, drugs, diseases, accidents, treatments, physiological names, operations, foods, appliances, etc., etc., encountered in the ward or sick room. By HONNOR M————. (*London : ————. London : The Scientific Press Limited.*)

Whatever may be said as to the value of compilations of this character, which do not attain the dignity of dictionaries of nurses' treatment, and are somewhat useless from many standpoints, there can be no question that the small amount of knowledge contained in them should be free from misleading errors. The

number of typographical errors in the volume before us seems extraordinarily large, as for example, accoucher for accoucheur, assafœtida for asafœtida, *bulbus occuli* for *bulbus oculi*, cacoglactic instead of cacogalactic, *concha oris* instead of *concha auris*, phagosites instead of phagocytes, pierotoxine instead of picrotoxine, *solens* instead of *soleus*, bilirubin for bilirubin, etc.

The combination of medical definitions and nursing directions is also far from a happy one. The following will serve as good examples of the method. "Abdomen : The belly ; the cavity between the chest and the groins. In abdominal injuries a nurse has usually to keep her patient at rest and watch for signs of peritonitis. *Laparotomy is the operation likely to be performed*." "Antitoxines : Injections of serum to counteract a disease. Tetanus is sometimes treated by injections from rabbits rendered incapable of taking the disease."

The definitions alone seem hardly more happy, as a few will readily show, e. g. "Anthracosis : Carbuncular disease (?) *caused by inspiring particles of coal*." "Argyll-Robertson pupil : Pupil of the eye which does not contract when subjected to light." "Bacteria : Rod-like microbes *supposed to infect the blood with different diseases*. They are unicellular and of fungous growth." Many important words are omitted, and many unimportant quack preparations are mentioned and defined, e. g. Warner's Safe Cure, Vinolia preparations, Beecham's Pills, and other equally unnecessary articles.

It would seem much better to divide "Medical Terms" from "Nursing Treatment," as the two portions of the book have little in common. A good dictionary of terms which nurses will meet with, correctly spelled and concisely, accurately defined, would be a great convenience to nurses. A similar little volume, giving plain, simple descriptions of diseased conditions and furnishing clear directions as to the course to be pursued in emergencies, would also serve an excellent purpose. The combination attempted in the present book cannot be commended. The book is clearly, neatly printed, and the volume is a convenient size to carry in the pocket.

Chorea and Choreiform Affections. By WILLIAM OSLER, M. D. (*H. K. Lewis, London*, 1894.)

In this monograph of 120 pages of letterpress, Prof. Osler has presented to the medical profession a concise treatise upon the various forms of chorea and allied muscular spasms, which constitutes a distinct advance on former publications upon these subjects.

In the opening chapter a very interesting account is given of the earlier historic writings upon the subject, and a few pages further on, the principal more recent contributions to the literature, from England, the European continent, and from America, are outlined. In the next chapter the obscure etiology of the disorder is fully considered. Symptomatology occupies the succeeding two chapters, with a number of abstracts of graphic cases of mild and severe chorea. Chapter IV, "The Heart in Chorea Minor," is one of more than usual interest, and the great frequency of endocarditis in chorea is brought to the attention of the reader with the author's usual care and fidelity of detail. Attention is drawn to the fact that in the majority of cases of endocardial trouble in chorea minor, "the endocarditis is independent of, and not associated with acute arthritis, and that in a considerable proportion of cases, much larger than has hitherto been supposed, the complicating endocarditis lays the foundation of organic heart disease."

Chapter V treats of the anatomy, pathology, and treatment of the disorder. The author appears to be more inclined to consider chorea, in the strict sense of the word, to be of infectious rather than other nature, though truly, as he states, "we are evidently as yet only upon the threshold of the essential cause of either acute rheumatism or chorea. In both disorders there are facts highly

suggestive of an infectious nature, but more than this cannot be said at present."

Chapter VI leads to the consideration of choreiform affections. The various forms of habit spasm are very clearly defined, and it is pleasing to the reader to note how clearly Dr. Osler has drawn the distinction between these affections, so many of which are commonly confounded with the chorea of Sydenham. A considerable number of illustrative cases are introduced for the purpose of differentiating the various forms of spasm.

In the final chapter of the book, "Chronic Progressive Chorea" is considered from an historical, etiological, and clinical standpoint, but nothing especially new is developed. The last nine pages of the work are occupied by a careful analysis of seventy-three fatal cases of chorea minor, all but four showing heart lesions mainly in the form of endocarditis.

The monograph, from the introduction to the last page, is well written and very readable; and will probably for a long time occupy a standard place in the literature of one of the most extraordinary maladies that affects the human race.   H. J. B.

THE JOHNS HOPKINS HOSPITAL REPORTS,
VOLUME IV, No. 6,
(REPORT IN SURGERY, II) NOW READY.

CONTENTS:

THE RESULTS OF OPERATIONS FOR THE CURE OF CANCER OF THE BREAST

PERFORMED AT THE JOHNS HOPKINS HOSPITAL FROM JUNE, 1889, TO JANUARY, 1894.

By WILLIAM S. HALSTED, M. D.,
Professor of Surgery, Johns Hopkins University, and Surgeon-in-Chief to the Johns Hopkins Hospital

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Letters of inquiry can be sent, which will receive prompt answer, or personal interviews may be held.

Under the directions of the founder of the Hospital the free beds are reserved for the sick poor of Baltimore and its suburbs and for accident cases from Baltimore and the State of Maryland. To other indigent patients a uniform rate of $5.00 per week has been established. The Superintendent has authority to modify these terms to meet the necessity of urgent cases.

The Hospital is designed for cases of acute disease. Cases of chronic disease are not admitted except temporarily. Private patients can be received irrespective of residence. The rates in the private wards are governed by the locality of rooms and range from $20.00 to $35.00 per week. The extras are laundry expenses, massage, the services of an exclusive nurse, the services of a throat, eye, ear and skin or nervous specialist, and surgical fees. Wherever room exists in the private wards and the condition of the patient does not forbid it, companions can be accommodated at the rate of $15.00 per week.

CONTENTS.

PAPILLO-CYSTOMA OF THE OVARY.

By T. S. CULLEN, M. B., *Assistant in Gynecology.*

Although papilloma of the ovary is not particularly rare, this case is published on account of the involvement of both ovaries and because the places of origin are considered as being of interest. Moreover, as will be seen, the specimen was quite perfect.

Mrs. K., admitted to the service of Dr. Kelly, 2, 14, 1894. Æt. 41, married.

The patient complained of abdominal enlargement accompanied by loss of flesh and strength. She has been married 22 years and had one normal labor 20 years ago. Her only previous illness was typhoid fever, 10 years ago.

Present Illness.—In February, 1893, she began to feel languid, and was with difficulty able to continue her housework. In July she noticed a slight burning sensation in the right hypogastrium, not affected by exercise nor influenced by menstruation. Her body weight began to decrease. About September the abdomen commenced to enlarge and continued to increase in size. The weakness and emaciation also were progressive. In November she vomited a greenish fluid. Defecation was accompanied by some pain in the pelvis. Since that time there has been little change.

Menstruation commenced in her eleventh year, was regular, moderate in amount and somewhat painful. In November, *the menses suddenly ceased* and have not recurred.

Physical Examination.—The patient is fairly well nourished. Her mucous membranes are somewhat anæmic. Heart and lungs apparently normal. Liver dulness not increased. The abdomen is enormously and symmetrically distended. The greatest prominence is below the umbilicus. The lineæ albicantes in the lower abdominal zone are very prominent. The superficial veins are distended.

Palpation.—Some superficial œdema above the symphysis pubis. No masses to be felt.

Percussion.—No tympanitic note can be elicited below the umbilicus. A distinct wave of fluctuation is felt. Above the umbilicus the tympany extends 16 cm. to the right and 12 cm. to the left of the median line.

Abdominal Measurements.—

Umbilicus to ensiform cartilage	21 cm.
" " pubes	21 "
" " right anterior superior spine	27 "
" " left anterior superior spine	27 "

Greatest circumference 145 cm., at the umbilicus.

Vaginal Examination.—The orifice is normal; the cervix is in the axis of the vagina: uterus retroflexed, apparently fixed in the pelvis. No tumor felt.

Per rectum.—In Douglas' pouch a mass of enlarged glands can be detected, conveying the impression of small papillomatous masses.

2, 15, 1894. *Operation by Dr. Kelly.* Ether anæsthesia. On opening the abdomen 17 litres of fluid were found free in

the cavity. On both sides large cysts were seen, occupying Douglas's cul-de-sac; by these the uterus was pushed forward. The left side was elevated, tied off and removed without difficulty. The right side was enucleated after being liberated from dense adhesions to the broad ligament and to the posterior surface of the uterus. Adhesions between the bladder and broad ligament were cut, and about eight small papillary nodules were excised from the pelvic floor. It was impossible, however, to remove all of them on account of their intimate relation to the bowel. The peritoneum was thoroughly sponged out and the wound closed. Silk sutures were used throughout. During the third week the temperature rose to 101.8° and fluctuated between that and 99.5° for three days, otherwise the patient had an uninterrupted recovery, and was discharged on March 20, feeling well.

Pathological Report.—Right side, the ovary is replaced by a tumor 8.5x8x7 cm. This is irregular in contour, being made up of several cysts, varying in size. These cysts are bluish-white and translucent. The most dependent part of the tumor is yellowish in color. Springing from the uterine side of the tumor is a pinkish cauliflower-like mass which has a somewhat narrowed base. The interior of the tumor is occupied by five cysts; these are smooth-walled, but have, developed upon their inner surfaces, small papillary-like masses. The fluid in the large cyst is somewhat tenacious, in the smaller ones limpid. The tube is 4 cm. long, 5 mm. in, diameter. Its fimbriated end is free. Parovarium is normal.

Microscopically.—The cyst walls are composed of connective tissue moderately rich in cells. Several corpora fibrosa are scattered throughout the wall. The outer surface is lined by flat epithelium. The papillary masses springing from the outer surface are composed of finger-like projections of connective tissue which become branched toward their termination. The connective tissue near its attachment to the cyst wall is moderately rich in cells, but as it passes outward the cells diminish in number and the stroma presents a hyaline appearance. The surface epithelium as it approaches the papillary masses becomes cuboidal, and where covering the masses is cylindrical. The inner surface of the cyst wall is lined by cylindrical epithelium. The papillary masses springing from the interior, Fig. 3, present the same appearance as those on the outer surface, but appear to have no connection with them.

Left Side.—The ovary is converted into a similar tumor of the same size; here, however, the papillary masses tended to spring from the depressions between the cysts. Both tubes normal.

Source of Origin.—The outer ones undoubtedly spring from the germinal epithelium. It is the opinion of Professor Welch that those on the inner surface of the cysts originated in the cells of the Graafian follicles; the cysts forming first, and the papillary masses developing secondarily. This mode of origin is, we consider, indicated by the small number of cysts present. The small masses from the tissue surrounding the rectum presented a typical papillary appearance.

Professor Abel made a chemical examination of the fluid from the abdominal cavity. The fluid was yellowish in color and presented a greenish tinge, was alkaline in reaction and had a specific gravity of 1020. It contained serum albumen, serum globulin, a trace of sugar and fibrin.

Although the prognosis in this case was considered unfavorable owing to the incomplete operation, the patient has, during the six months following the operation, gained 49 pounds.

The sudden cessation of menstruation is of especial interest as associated with the diseased condition of the ovaries.

DESCRIPTION OF PLATE.

Fig. 1.—Natural size of tumor from right side, hardened in Müller's fluid and then cut open. Springing from its outer surface are papillary masses. Internally it is composed of one large and several smaller cysts. Projecting from the inner surface of these are papillary masses. The large cyst, *c*, contains a tenacious fluid which was coagulated by the Müller's fluid. *a* is a cross section of the normal Fallopian tube.

Fig. 2 is the other half of Fig. 1. The coagulated fluid has been washed out of the large cyst cavity, enabling one to see the papillary masses more distinctly.

Fig. 3 is a section of a small nodule taken from the inner surface of the cyst in Fig. 1 at the point represented by *b*. (Winckel Ocul. I, Obj. 3.) *d* is the cyst wall, which is composed of wavy fibrous tissue poor in blood supply. The inner surface of the cyst is covered by one layer of cylindrical epithelium. The papillary mass presents a tree-like appearance. It also is composed of connective tissue, which becomes less dense the farther it is away from the cyst wall. All the folds and convolutions of this papillary mass are covered by one layer of cylindrical epithelium. In some places the cells have been cut slantingly and then look somewhat like squamous epithelium. The orange-colored areas are blood-vessels.

Fig. 1

Fig. 2

Fig 1

Fig 2

Fig. 3.

THE LEUCOCYTES IN CROUPOUS PNEUMONIA.

By John S. Billings, Jr., *Assistant Resident Physician, Johns Hopkins Hospital.*

The increase in the number of leucocytes in the blood in croupous pneumonia may be said to have been first noticed by Piorry[1] in 1839. He remarked that the so-called "crusta phlogistica," seen above the clotted blood withdrawn by venesection from patients suffering from any of the acute inflammatory diseases, was most marked in pneumonia. It was thickest at about the seventh or eighth day, just before the crisis, and he thought it to be due to an hæmitis or an actual inflammation of the blood itself.

Virchow[2] in 1871 spoke of a leucocytosis in pneumonia and held that there was an actual new formation of leucocytes, *i. e.* an absolute increase in the total number present in the circulation, but only in those cases in which there was swelling of the bronchial glands.

Since then there have been many investigations on the subject, especially in the last four years. Nasse,[3] Koblanck, Sörensen and Pée all noted the presence of a leucocytosis during the course of croupous pneumonia, but they did not speak of its relation to the temperature, nor to prognosis.

Halla[4] in 1883 was the first to report a series of cases, fourteen in number. In twelve of these there was a leucocytosis, while in the remaining two the leucocytes were not increased. Both the latter cases ended fatally. He was the first to call attention to the fact that the absence of leucocytosis is of bad omen. He found no correspondence between the temperature and leucocyte curves in those cases ending in recovery.

Hayem and Gilbert[5] in 1884 remarked upon the typhoid character of those cases of pneumonia in which there is no leucocytosis.

Tumas[6] in 1887 stated that there was a rough daily correspondence between the temperature and the leucocytes, and that the number of the latter was greatest at the severest stages of the disease. He also noted that the leucocytes did not reach normal at the same time as the temperature, but remained elevated for three or four days after the crisis.

Boekmann[7] and Von Jaksch[8] claim that there is a constant relation between the number of leucocytes and the temperature in various acute infectious diseases, and particularly in pneumonia.

Kikodse[9] states that leucocytosis is absent only in fatal cases. He believes that the leucocytosis begins before the involvement of the lung takes place, that it runs parallel with the temperature, and falls to a point below normal with the crisis in temperature.

Roemer[10] believes the leucocytosis in pneumonia to be caused by the products of destruction (bacteria, cells, etc.) brought about by the alkali-proteins, and not directly by the alkali-proteins themselves.

Von Jaksch,[11] recognizing the bad prognosis in cases which showed no leucocytosis, and believing that the fatal termination was due directly to its absence, recommended the use of drugs which would produce an increase in the number of leucocytes in the blood. (Antipyrin, pilocarpin, etc.) Such treatment was ineffectual, as will be demonstrated later.

Maragliano[12] does not think that the number of leucocytes is of any prognostic value.

Rieder[13] reports his observations in twenty-six cases. He finds that the fall of the leucocytes generally precedes the fall of temperature, but that the number of the leucocytes, while beginning to fall first, may often remain elevated for several days after the temperature has touched normal. This is particularly marked in cases of delayed resolution. In cases ending by lysis the leucocytes fall correspondingly slowly. A pseudo-crisis may be recognized by the fact that while the temperature may fall to normal, the leucocytes remain steadily elevated. He finds no correspondence of the leucocyte and temperature curves. The leucocytosis was present in one case six hours after the chill. In fatal cases there was no leucocytosis, but the blood showed the characteristic change noted in so-called pure leucocytoses, *i. e.*, a marked relative increase in the number of so-called polynuclear elements. He does not think there is any relation between the amount of leucocytosis and extent of lung involved.

V. Limbeck[14] holds that only those infectious diseases with exudation into the tissues show an increase in number of the leucocytes. The amount of leucocytosis depends upon the quality and quantity of the exudate, *i. e.*, the more cells and the larger the exudate, the greater the leucocytosis. He states that in pneumonia the leucocytosis disappears with the fever. Should there be a new extension of the disease and a rise of fever, the leucocytosis reappears a few hours before the rise in temperature takes place. A pseudo-crisis may be recognized by a steady leucocytosis. A fatal ending is foreshadowed by a steady rise in the number of the leucocytes.

Tchistovitch[15] inoculated rabbits with cultures of pneumococcus and found a leucocytosis only in those cases ending in recovery. The use of stronger cultures which killed the animal did not cause any leucocytosis, but brought about an actual reduction in the number of the leucocytes, *i. e.*, a so-called leukolysis. This was confirmed by Rieder (l. c.).

Laehr[16] reports observations of the leucocytes in sixteen cases of pneumonia. He found the leucocytosis in one case to be present eight hours after the chill. The leucocytes rise one to two days before the crisis, to sink again before the crisis takes place. The temperature reaches normal before the leucocytes. He finds no exact correspondence between the number of leucocytes, the fever and the amount of lung involved, but thinks they do correspond roughly. He believes the leucocytosis to be due to chemotaxis, the attracting substances being the alkali-proteins, etc., produced by the pneumococcus. Persistence of the leucocytosis signifies delayed resolution of the pneumonic consolidation, and its reappearance indicates a recurrence of the disease.

Schulz[17] states that the leucocytosis observed in pneumonia, as well as all other inflammatory conditions, is not due to any absolute increase in the number of leucocytes in the circulation, but only an altered division. He believes that in health the large abdominal vessels contain many more leuco-

cytes ("Wandständig") than the peripheral vessels. In disease the presence of abnormal chemotactic substances in the blood, and the increased rapidity and force of the respiration and circulation, are enough to drive these extra leucocytes out into the circulation and to those points where they may be needed.

Rovighi[18] states that in pneumonia the leucocytes reach their highest point during the period of fall of temperature. He bases this statement on the results of experiments going to show that when the body is heated the number of leucocytes in the peripheral circulation diminishes, while cooling the body increases their number. These are purely local phenomena, not due in any way to changes on the part of the blood-making organs.

Cabot[19] reports observations in seventy-two cases of pneumonia. Seven of these ended fatally, and six out of the seven showed no leucocytosis. In one case ending in recovery, which showed no leucocytosis at first, there was a steady rise in the number of the leucocytes towards the end of the disease. He does not think that there is any relation between the amount of leucocytosis, the degree of severity of the case, and amount of lung involved.

Ewing[20] reports a number of cases, and draws the following conclusions. 1. The greater the amount of lung involved, the greater the leucocytosis. 2. The amount of leucocytosis corresponds to the "systemic reaction," the latter being judged by the temperature, pulse and general condition of the patient: i. e., in fatal cases there is no leucocytosis, and vice versa. 3. A well marked leucocytosis indicates a severe infection, a low leucocytosis is unfavorable, and the absence of any leucocytosis makes the prognosis very grave.

Tchistovitch[21] reports the results of some further inoculation experiments upon animals. As is well known, the inoculation of animals with certain substances (tuberculin, sterile culture of staph. py. aur., and pilocarpin) produces first a temporary leukolysis (so-called), which is followed by a marked leucocytosis. He found that those substances which produce a leucocytosis in healthy rabbits do not do so when injected into rabbits previously inoculated with virulent cultures of pneumococcus. The progressive diminution of the leucocytes caused by the latter substance steadily continues, or at most there is only a slight transient leucocytosis, which is followed by a fresh fall. He holds this to show that those cases of pneumonia which succumb to the great virulence of the specific pneumococcus, should show no leucocytosis, and that no stimulant of leucocytosis should be able to produce any leucocytosis in such cases. So that the presence of a leucocytosis in fatal cases of pneumonia should make us doubt that the virulence of the specific pneumococcus was the cause of death, and we should seek some other cause of death in such cases, such as extensive involvement of the lungs or localization of the disease in the heart or in the brain.

When he injected the pneumococcus culture into the brain of the animal there was produced a meningo-encephalitis with a marked rise in the number of leucocytes in the blood. The amount of culture used was just so much as, injected elsewhere in the body, would bring about a severe infection with leukolysis, but without fatal termination. In conclusion, he holds that the presence or absence of leucocytosis only shows

the virulence of the poison and is not a criterion of absolute prognosis.

He saw four fatal cases of pneumonia. In one there was no leucocytosis. Of the other three, all of which showed a leucocytosis, one had endocarditis and meningitis, another meningitis, while the third case showed extensive consolidation of both lungs.

Bieganski[22] reports a series of cases, paying especial attention to the relative numerical proportions of the various forms of leucocytes. In cases showing a marked leucocytosis, 80 to 90 per cent. of the leucocytes are polynuclears, while the eosinophiles and blood-plates are practically absent. Just after the crisis in temperature the polynuclears sink to below 60 per cent., while the eosinophiles and blood-plates reappear in increased numbers, about three days being taken for the blood to return to its normal condition. In fatal cases the polynuclears are reduced to 50 per cent. or below. Such a condition of the blood together with an absence of leucocytosis makes the prognosis unfavorable.

He holds that the leucocytosis in pneumonia is due to a lessened destruction of the polynuclear forms. This is brought about by the toxines of bacterial origin which are circulating in the blood. The mononuclear elements are unaffected and continue to enter the circulation and to develop there into polynuclears. Here all progress ceases and there is neither any destruction of the polynuclears with formation of blood plates, nor further development of the polynuclears into eosinophiles. In the fatal cases the toxines are supposed to have a paralyzing effect upon the development of all the forms of leucocytes, and also to prevent the entrance of young forms into the circulation.

The twenty-two cases here reported were not picked ones, excepting that eight or ten were thrown out, either because too few counts were made or because the crisis in temperature occurred within twenty-four hours after entry into hospital. The methods and precautions used in counting the blood, and in examining and preparing dried and stained specimens, were exactly the same as those employed in the investigations of the leucocytes in malarial fever reported by the writer in the October number of this journal for 1894.

In each case charts were made of the leucocyte and temperature curves, so that comparison of the two could readily be made. Three of these charts are reproduced in this article. The leucocytes were counted on an average of twice a day during the febrile period.

CASES.

1. W. R., æt. 26. Illness lasted 12 days. Right middle, right lower and left lower lobes involved. Temperature ranged high until sixth day, when it fell by lysis, taking 6 days to reach normal. Leucocytes 39,500 six hours after chill. No daily correspondence with temperature curve; they reached their highest point (50,000) two hours after temperature began to fall. Thenceforth they fell steadily, reaching normal one day after temperature.

2. S. F., æt. 51. Illness lasted 8 days. Right middle and lower lobes involved. Temperature ranged at 102° for 6 days; fell by lysis, reaching normal in 50 hours. Leucocytes 42,000

Blood Chart. Eschbach. Ward F.

Black = leucocytes.   Broken = temperature.   Dotted lines, normal.

1894.

May.   June.
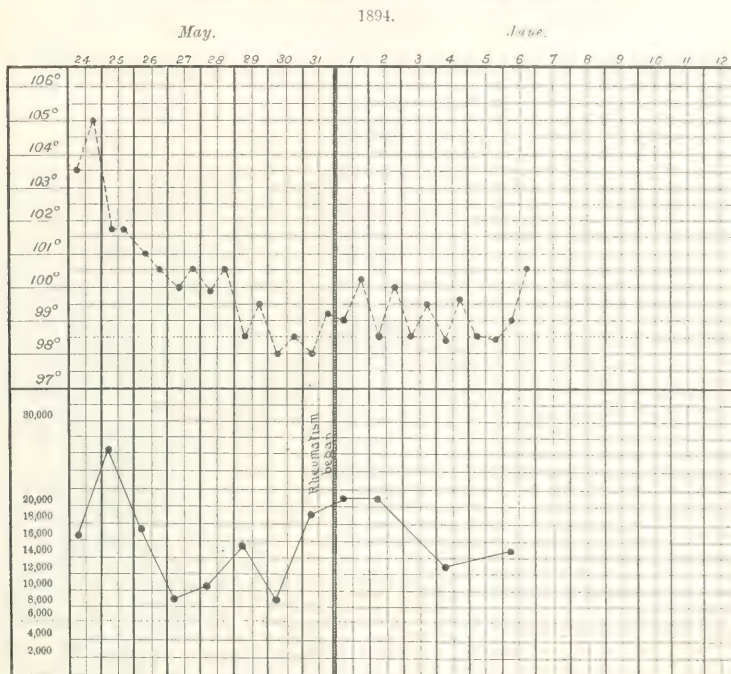
Case 4. Pneumonia and Rheumatic Fever. Showing fall by lysis

8 hours after chill. They fell steadily until temperature began to fall, when they rose sharply to 38,000, reaching normal 2 days after temperature.

3. H. H., æt. 22. Illness lasted 17 days. Right middle and lower lobes involved, with delayed resolution. Temperature fell on seventh day of disease, to rise again sharply to 102°. Fell again by lysis, reaching normal in 5 days. Leucocytes ranged between 20,000 and 28,000 until the day the temperature touched normal, when they began to fall, reaching normal eleven days after temperature.

4. R. E., æt. 42. Illness lasted 9 days. Right middle and lower lobes involved. For temperature and leucocytes see chart. Leucocytes reached highest point (27,000) during period of fall of temperature. They reached normal at the same time as the temperature. Two days afterwards P. was taken with acute rheumatic fever, with a simultaneous rise of temperature and leucocytes. P. still had rheumatism when discharged at his own request.

5. J. S., æt. 13. Illness lasted 6 days. Right middle and lower lobes involved. For temperature and leucocytes see chart. Leucocytes rose during fall of temperature, but had reached their maximum before that time. They reached normal 36 hours after temperature, the crisis in which took 24 hours.

6. E. W., æt. 7. Illness lasted 9 days. Left lower lobe involved. Temperature ranged high until 8th day, when there was a pseudo-crisis, the temperature rising sharply afterwards. Crisis took place the following morning, lasting 2 hours. Leucocytes ranged at 24,000 until the true crisis took place, when they began to fall, but did not reach normal until two days after temperature.

7. G. S., æt. 40. Alcoholic history. Illness lasted 7 days. Left upper lobe. Temperature ranged at 105 until 5th day, when it began to fall, reaching normal in 36 hours. Leucocytes ranged very low during whole course of disease, reaching their maximum (13,000) during the period of fall of temperature. This, together with the history and situation of disease, made the prognosis a grave one, but patient made an uninterrupted recovery.

8. E. F., æt. 20. Illness lasted 8 days. Right middle and lower lobes were involved, with delayed resolution. Temperature ranged high until the 7th day, when it fell by lysis, reaching normal in 10 hours. Leucocytes ranged at about 25,000 until crisis in temperature, when they were slightly fell to 16,000, followed by a gradual rise to 27,000, the leucocytes not reaching normal until 7 days after temperature.

9. C. J., æt. 30. Patient was admitted for active articular fever. Lungs were clear of pneumonia, and the pneumonia

Blood Chart. Schultz. Ward F.

Black = leucocytes. Broken = temperature. Dotted lines, normal.

February, 1893.
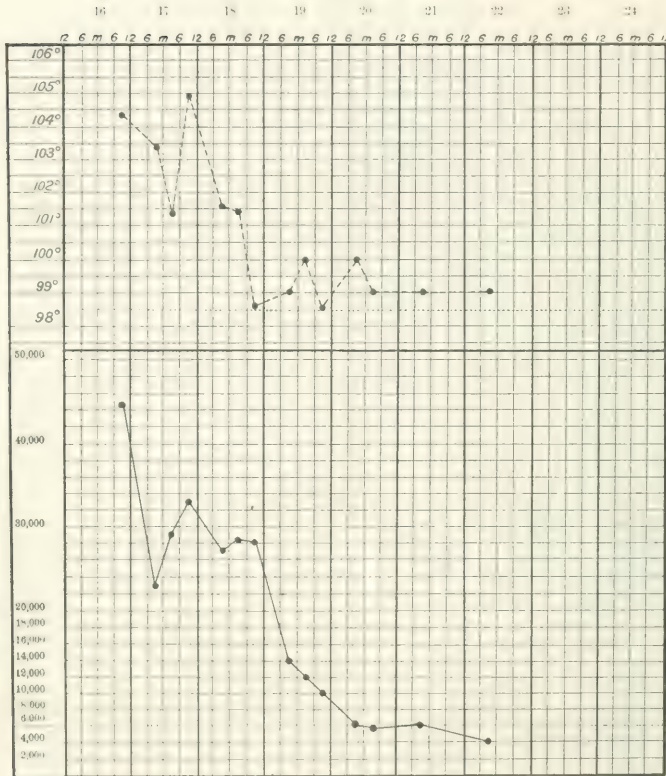
Case 5. Pneumonia. Showing fall by Crisis.

began 36 hours later. For temperature and leucocytes see chart. Quinine was given on the evening of the chill, and the malarial organisms rapidly disappeared, and with their disappearance the number of leucocytes rapidly increased. There was successive involvement of the right lower, right middle and left lower lobes, each fresh extension of the disease being followed by a sharp rise in the number of the leucocytes. Leucocytes reached highest point (68,000) just before the fall in temperature began, and thenceforth decreased in number, reaching normal 6 days after temperature.

10. E. M., æt. 45. Illness lasted 10 days. Left upper lobe involved. Temperature ranged at 103° until 9th day, when it fell by crisis, reaching normal in 16 hours. Leucocytes reached maximum (36,000) two days before crisis. They fell with temperature, but did not reach normal until two days after crisis.

11. C., æt. 26. Illness lasted 13 days. Right upper, middle and lower lobes involved. Temperature ranged at 104° until

11th day, when it fell by crisis, reaching normal in 48 hours. Leucocytes low on admission; reached maximum (29,000) during period of fall of temperature. Did not reach normal until 7 days after temperature.

12. L. K., æt. 24. Illness lasted 8 days. Right lower lobe involved. Temperature ranged high until 8th day, when it fell to normal in 24 hours. Leucocytes ranged at 25,000 until crisis in temperature occurred, when they fell to 16,000, but rose again to 29,000 (maximum). They did not reach normal until 8 days after temperature. Delayed resolution.

13. J. H., æt. 41. Illness lasted 10 days. Right upper lobe involved. Temperature ranged between 102° and 104° until day of death, when it fell, being 100° 2 hours before death. Leucocytes 22,000 on admission, rose to 38,000 that p. m., falling steadily afterwards. 10,000 just before death. No autopsy.

14. J. W., æt. 73. Illness lasted 8 days. Right upper, middle and lower lobes involved. Temperature ranged at

BLOOD CHART.   JONES, C. J.   WARD F.

Black = leucocytes.   Broken = temperature.   Dotted lines, ...
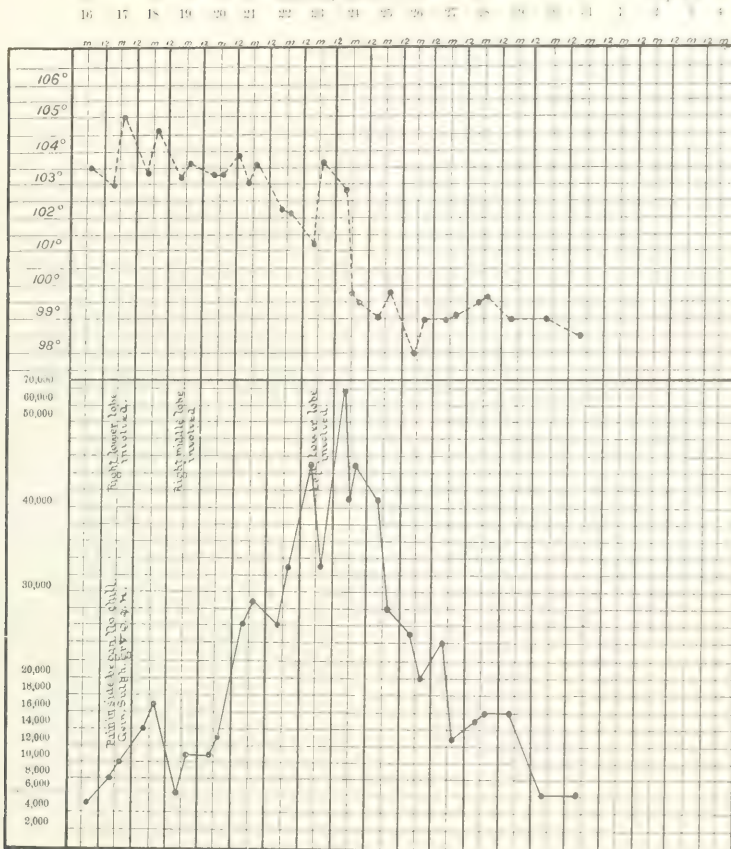
CASE 9.   PNEUMONIA AND MALARIA.   SHOWING FALL BY CRISIS.

101° until 30 hours before death, when it rose to 104°. Leucocytes ranged at 25,000 from admission until death. Autopsy. In addition to pneumonic consolidation above noted, P. had an acute fibrino-purulent meningitis due to the dip. pneumoniæ.

15. G. W., æt. 25. Illness lasted 10 days. Right upper, middle and lower and left lower lobes involved. Temperature ranged from 101.5° to 104°, being 104.2° at death. Leucocytes 8,000 on admission, rose steadily until time of death 8 days later, when they were 30,000. Autopsy showed the pneumonic consolidation above noted. No meningitis nor endocarditis.

16. K. D., æt. 47. Illness lasted 4 days. Right upper and middle lobes involved. Temperature ranged at 102.5° until death, with a pseudo-crisis to 99° 12 hours before death. Leucocytes 18,000 on admission, where they ranged until death. 15,000 just before death. No autopsy.

17. C. L., æt. 36. Illness lasted 21 days (?). Lower lobes of both lungs involved. Temperature ranged steadily at 102° until 12 hours before death, when there was a sharp rise to 103° just before death. Leucocytes 13,000 on admission, fell gradually to normal in two days. They began to rise 36 hours before death, reaching 32,000 just before the end. No autopsy.

18. J. C., æt. 63. Illness lasted 11 days. Right middle and lower lobes involved. Temperature ranged at 103.5° until 2 days before death, when it rose to 104.3°, falling to 104° just before death. Leucocytes 8,000 on admission. Remained normal until day before death, when they rose to 20,000, falling to 15,000 before death. No autopsy.

19. F. S., æt. 50. History of alcoholism. Illness lasted 24 days (?). Right upper and middle lobes involved. Temperature ranged at 104° during the five days preceding death.

The afternoon of the fourth day the P., being left alone for a moment, climbed through the top of a window and fell to the ground outside, breaking vertebral column and both bones of right leg. Unsatisfactory coroner's inquest showed nothing beyond the fractures and the pneumonic consolidation above noted. Leucocytes 15,000 on admission; for the first 3 days fell gradually to 11,000, but after the accident above referred to, rose to 18,000. P. lived 4 hours after the accident occurred.

20. H. L., æt. 41. Illness lasted 5 days. Right lower base involved. Temperature on admission 102.5°. For next three days it ranged at 104°, being 103.8° just before death. Leucocytes 10,000 on admission, after which time they ranged steadily below normal; from 6,000 to 1,500. They were 4,000 just before death. No autopsy.

21. A. N., æt. 47. Illness lasted 12 days. Lower lobes of both lungs involved. Temperature ranged from 103.5°–105°, until shortly before death, when it rose to 107°. Leucocytes 15,000 on admission; 2 days later they rose to 28,000. Ranged at 22,000 until just before death, when they touched 30,000. No autopsy.

22. A. P., æt. 22. Illness lasted 3 days. Left lower lobe involved. Temperature ranged steadily at 103° until death. Leucocytes 50,000 on admission; fell steadily, being 20,000 when death occurred. Autopsy showed beside a double lobar pneumonia, an acute nephritis and fatty degeneration of heart muscle, together with hemorrhage into pericardial sac, with the presence of dip. pneumoniæ.

Of these twenty-two cases, twelve recovered and ten died. Of the twelve favorable cases, four ended by lysis and eight by crisis.

Taking up first the four cases ending by lysis, we see that in all there was a marked leucocytosis at some period of the disease. Examination of the combined leucocyte and temperature charts showed that before the temperature began to fall there was no daily correspondence between the two curves. In all four cases the two curves began to fall together, the leucocytes not reaching normal until one, four and fourteen days after the temperature in cases 1, 2 and 3 respectively. In case 3 there was delayed resolution of the consolidation, it not having entirely cleared up on discharge.

In cases 1 and 3 the leucocytes reached their maximum during the period of fall of temperature. There was a sharp rise during that period in case 3, but the maximum had been reached before the temperature began to fall.

In case 1, where there was involvement of both lungs, the leucocytes reached 50,000. In the other three cases the lower portion of the right lung was involved and the range of the leucocyte curves was moderate, being above 30,000 in only one instance.

In cases 1, 2 and 4 the fall in temperature preceded the fall of leucocytes.

Case 4 is interesting on account of its complication with rheumatism. The combined chart is given and it shows well the correspondence of the two curves. The occurrence of a moderate leucocytosis during the course of rheumatic fever has been mentioned by several observers. In cases 1 and 2 the

leucocytes were 39,500 and 42,000 6 and 8 hours after the chill, respectively.

Of the eight cases ending by crisis, in all but one there was a marked leucocytosis during the febrile period of the disease. In the remaining case the leucocytes, while ranging at normal during the greater period of the disease, touched 13,000 on one occasion. [Case 7.] Examination of the combined charts showed no daily correspondence of the two curves before crisis occurred. The leucocytes began to fall before the temperature in three cases, with it in two, and after it in three. The fall of leucocytes was only partial in six cases, however, and they did not reach normal until from two to eight days after the temperature. In cases 6 and 7 the leucocytes and temperature reached normal at the same time. In cases 7, 9, 11 and 12 the leucocytes reached their maximum during the period of fall of temperature. In cases 5 and 8 there was a rise of leucocytes during that period, but the maximum had been previously attained. Most of these points are well shown in a combined chart of the eight cases, showing the average temperature and number of leucocytes, twelve, twenty-four and thirty-six hours before and after the crisis in temperature.

Black = leucocytes.   Broken = temperature.
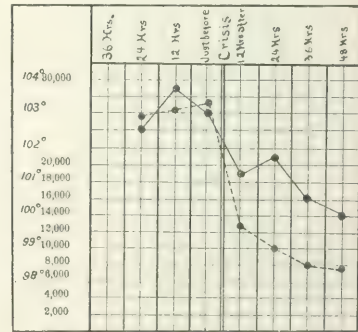
CHART SHOWING TEMPERATURE AND LEUCOCYTE CURVES OF
PNEUMONIA. CRISIS.

In case 9 the lower portions of both lobes were involved and the leucocytes touched the highest point reached in any of the cases, viz., 68,000. In case 11 however, where there was the same extent of involvement, the leucocytes only reached 29,000. In case 7 only the left upper lobe was involved and the leucocyte range was practically normal, only once being above 10,000. The prognosis in this case was thought to be grave at first on account of the absence of leucocytosis, the position of the consolidation, the alcoholic history and patient's age. The patient made an uninterrupted recovery however, and the infection was evidently a very mild one. In the other five cases only a portion of one lung was involved and the leucocyte curve ranged moderately high.

In only one of the eight cases was it possible to count the blood before and after the chill. This was case 9, in which the pneumonia came on while patient was being treated for malarial fever of the double tertian type. In the article on the leucocytes in malarial fever, previously referred to, the

fact is brought out that in malarial fever the leucocytes range constantly below normal during the course of the disease. This is due in some way to the presence of the malarial organism in the blood. It is not settled as to whether it is a leukocytolysis (an actual destruction of leucocytes) or a leuko-penia (a diminished production). Now in case 9 there was no leucocytosis either before or after the chill, until the exhibi-tion of quinine caused the disappearance of the malarial organisms from the blood, when the leucocytes promptly rose. It is interesting to note how, as each new portion of the lung was involved, there was a corresponding rise in the number of the leucocytes. [See chart.]

Of the ten fatal cases only one (No. 20) showed a complete absence of leucocytosis during the entire course of the disease. In cases 16 and 19 the leucocytes, while being always above normal, ranged relatively low, never being above 19,000. In case 14 the leucocytes behaved as one would expect them to in an uncomplicated case ending in recovery. In cases 15, 17 and 21 the leucocytes were practically normal on admission, but gradually rose during the ensuing three or four days, touching just before death 30,000, 32,000 and 30,000 respec-tively. In cases 13 and 22 the leucocytes were high on admission, but fell steadily from that time on until death. In case 18 they were normal for the first two days, but rose sharply to 20,000 24 hours before death, falling slightly just before the end.

Thus we see that in fatal cases the behavior of the leuco-cytes varies widely. In six cases there was absence of leuco-cytosis at some period of the disease, but the continuous absence is the exception, not the rule. In none of the cases was there any daily correspondence between the temperature and leucocyte curves. In the four cases in which the leuco-cytes rose at the end however, there was a corresponding rise in temperature. As regards the relation of the amount of leucocytosis to the extent of lung involvement, no definite conclusions can be drawn. In case 15, where the entire right lung and a portion of the left were involved, the maximum leucocytosis was only 30,000 just before death. None of the cases were seen until at least twenty-four hours after the chill, so that no data are furnished as to how early the leucocytosis appears.

Autopsies were obtainable in only three out of the ten cases. This does not include the coroner's inquest on case 19. The results of these autopsies bear out Tchistovitch's statements however. In case 14, where the leucocytes ranged above 20,000, an acute fibrino-purulent meningitis was found to be present. In case 15, where the leucocytes ranged from 17,000 to 30,000 for 5 days, extensive involvement of both lungs was found. In case 22, where the leucocytes ranged from 50,000 to 20,000, there was found at autopsy double lobar pneumonia, acute nephritis, fatty degeneration of the heart muscle, and hæmorrhage into the pericardial sac, with the presence of the diplococcus pneumoniæ in the latter situation. In case 19, where the leucocytes ranged at 18,000, the fracture of the spine was probably the immediate cause of death. In case 21 there was involvement of both lungs, with a leucocyte range above 20,000. All the remaining cases, with the exception of No. 13, showed a low range of leucocytes, and it is only fair

to consider it possible that in case 13 also, an autopsy might have revealed some complication or condition accounting for the relatively high leucocytosis.

There are a number of theories as to the cause of leucocy-tosis. Virchow held that it was due to proliferation within the lymph glands, that it only occurred in those cases of disease associated with glandular enlargement; also that acute glandular enlargement was followed by leucocytosis. This is negatived by the absence of leucocytosis in many diseases accompanied by glandular enlargement (tuberculosis, acute Hodgkin's disease, etc.), and by the presence of marked leucocytosis in diseases associated with very slight glandular enlargement. [Pneumonia.] Every leucocytosis is probably associated with some glandular enlargement however. Such a leucocytosis as Virchow supposes would be a lymphocytosis, which is not the case.

Schulz's theory has been already mentioned. Its falsity would seem to be proved by the work of Goldscheider and Jacob (to be referred to later), who found that in cases show-ing a leucocytosis in the peripheral circulation, there was no corresponding diminution in the leucocytes in the central blood-vessels.

Römer (l. c.) thinks the increase due to direct multiplica-tion (by amitosis) of the leucocytes, the exciting cause of such multiplication being the destruction-products of the alkali-proteins, as has been mentioned. He thinks chemotaxis to play a large part. No such changes as he infers are to be made out in the blood.

Von Limbeck (l. c.) holds leucocytosis to be due to the action ("Fernwirkung") of the bacterial products themselves upon the leucocytes. He does not speculate as to the source from which the increase is drawn.

Bieganski's theory has been mentioned. Too little is known about the so-called blood-plates and eosinophiles to justify us in drawing conclusions from any variations in their number. Most authorities deny that the blood-plates are end-products of the polynuclear leucocytes.

Löwit[23] holds that every leucocytosis is preceded by a dimi-nution in the number of leucocytes. This is due, he thinks, to an actual destruction of the leucocytes, and he calls it leukolysis. This leukolysis is in turn followed by a pouring forth of young elements from the hæmatopoietic organs. This reparation far exceeds the destruction, in this way bringing about a leucocytosis. He demonstrates by injection experiments that the artificially-produced leucocytosis is pre-ceded by a leukolysis. His ideas as to the source from which the increase is drawn would seem to be negatived by the absence of evidence of new formation. Were new formation to occur, the blood would show a large number of young elements. This it does not do.

The latest work on the subject is that of Goldscheider and Jacob[24]. They make use of the terms hypo- and hyperleu-cocytosis for leukolysis and leucocytosis respectively. Their conclusions are as follows: Hypoleucocytosis is due to the leucocytes being driven into and detained within the capil-laries of certain organs of the body. Actual destruction plays a minor rôle. Hyperleucocytosis is due to an increased quantity of leucocytes being carried in the blood by the general stream.

There is no new formation of leucocytes, its absence being offset by the supposition that in the bone-marrow and spleen there are a large number of adult leucocytes held in reserve, as it were, which are carried off by the lymph stream into the general circulation when occasion arises. The occurrence of new formation is negatived by the absence of young forms in dried specimens.

All these phenomena are primarily due to the bacterial products or chemical substances in the blood. In most acute infectious diseases these substances are introduced into the circulation slowly and cause no diminution in number of the leucocytes, the latter rising immediately. This statement is borne out by experiment. This would mean that in pneumonia the leucocytosis would be found to be present at the time of the chill.

The authors are led to believe that the sources of the leucocytosis are the blood-making organs. But there is no evidence of new formation; hence their theory of a reserve force of adult leucocytes within those organs. This theory seems rather to be constructed to meet the necessity of the case than to be founded on sufficient evidence.

Sherrington[25] in a recent article reports observations of his own on inflammatory leucocytosis. He discusses most of the prevailing ideas, but formulates no new theory.

It is beyond the province of this article to enter into any further discussion of these theories. All we can say is that the leucocytosis in pneumonia is probably due in some way to the products of the diplococcus pneumoniæ. While the bacteria do not enter the blood as a rule, their products do, and in this way can influence the various organs of the body. There is probably no new formation of leucocytes, or at any rate it plays a minor rôle in the process, and some other source for the increase in number of the leucocytes must be sought for.

The behavior of the leucocytes depends upon the virulence of the bacterial products. In fatal cases where the virulence is great, a rise in the number of leucocytes is rendered impossible. It is doubtful whether there is any actual diminution of their number, there being no evidence that actual destruction of leucocytes takes place. The virulence may be so modified as to permit of a gradual increase in number of the leucocytes, yet still be potent to cause death. Cases may begin favorably and the leucocytes may range high at first; the virulence of the bacterial products may then increase, causing a gradual reduction of the leucocytes, and death. The sharp rises sometimes observed just before death may be associated in some way with the pre-agonal leucocytoses. We must not forget that the disease may be present in so mild a form that the leucocytes are unaffected and remain normal throughout. This is shown in case 7 of our series. Most of the above points are shown in the following table:

1. Very mild infection: No effect on leucocytes. Normal range.

2. Moderate infection: Moderate leucocytosis.

3. Severe infection (as to extent of lung involvement): Marked leucocytosis.

4. Severe infection (as to virulence of bacterial product): Moderate leucocytosis.

5. Very severe infection: No leucocytosis.

It has not been proved, as will be shown later, that the blood condition in the fatal cases differs in any way from the normal as regards the relative numerical proportions of the various forms of leucocytes.

If this be true, it is easy to see that the examination of the blood in pneumonia is not of absolute prognostic value. The blood only furnishes an indication of the virulence of the bacterial products; the extent of lung involvement, the general condition of the patient, and the temperature must also be taken into account in every case. For instance, should we be guided by the blood condition alone, our prognosis in cases coming under the heads of 1 and 5 in the above table would be either favorable or unfavorable according to the view we took. The error would of course be fatal.

The absence of leucocytosis in the fatal cases is evidently not the cause of death. Hence the failure of Von Jaksch's treatment by injecting such substances as would produce a leucocytosis in the healthy individual.

Regarding the question of the variations of the various forms of leucocytes, too much time was taken up by the actual counting to allow of much work in this direction. Twenty counts were made in the various cases showing a marked leucocytosis, with the following average result: Polynuclears, 91.2 per cent.; mononuclears, 9.6 per cent.; eosinophiles, 0.2 per cent. Three counts were made in cases showing no leucocytosis, and the results were practically those which would have been obtained in counting the leucocytes in normal blood, thus agreeing with neither Rieder nor Bieganski.

	Polynuclears.	Mononuclears.	Eosinophiles.
(a)	71.8 per cent.	28.2 per cent.	0
(b)	73.5	26.1	0.4 per cent.
(c)	76.1	23.4	0.5

Count (c) was in case 18. As has been mentioned, the leucocytes rose sharply just before death. A count was made two hours before death and the increase was found to be in the polynuclears solely. Polynuclears, 95.4 per cent.; mononuclears, 4.3 per cent.; eosinophiles, 0.3 per cent.

These counts would seem to make it doubtful that Bieganski's conclusions hold. The number of counts however, is too small to have any weight.

Conclusions.

1. In cases of pneumonia pursuing a favorable course there is, as a rule, a marked increase in the number of the leucocytes during the febrile period of the disease. This leucocytosis is probably present at the time of the chill, and may be very marked within a few hours. There is no correspondence between the daily temperature and leucocyte curves during the febrile period.

2. In those cases in which the temperature curve falls by crisis, the leucocyte curve begins to fall within a few hours of the same time. The fall of the latter is only partial however, and rarely reaches normal as soon as the temperature curve, generally taking about 48 hours longer. In cases ending by lysis the two curves fall together, the temperature always reaching normal first. In cases of delayed resolution the leucocytes may remain elevated for days.

3. In a majority of the cases the leucocyte curve rises during the period of fall of temperature, and may reach its maximum at that time. Such a rise is only transient, however, and is soon followed by a fresh fall.

4. In cases showing extensive involvement of both lungs, the leucocytes are apt to reach a higher point than in those cases where the involvement is only moderate. The correspondence of lung involvement and amount of leucocytosis is a very rough one however.

5. The fatal cases may show either the presence or absence of leucocytosis. In those cases showing a leucocytosis, some other cause of death than the virulence of the bacterial poison must be sought for.

6. The prognosis in cases showing a complete and continuous absence of leucocytosis is unfavorable as a rule. A continuous absence of leucocytosis is the exception, most cases showing a leucocytosis at some period of the disease. The possibility of the absence of leucocytosis being due to extreme mildness of the disease must not be overlooked.

7. The leucocytosis in pneumonia is a so-called pure leucocytosis, i. e. an increase in the polynuclear elements solely. In cases showing no leucocytosis, the blood condition according to the observations here reported, is normal. Further investigations are necessary before the work of previous observers can be positively contradicted.

8. The presence or absence of leucocytosis only shows the virulence of the bacterial poison. It is not a criterion of absolute prognosis.

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A POSTSCRIPT TO THE REPORT ON APPENDICITIS.

By W. S. Halsted, M. D., Surgeon-in-Chief, etc.

Dr. Finney's remarks on the treatment of the wound in cases of appendicitis have been abbreviated so much as possibly to mislead those who are not familiar with our methods. When he speaks of "leaving the abdominal wound open" he means that the wound is drained with gauze, and that no attempt is made to close it. The fact is that the wound is sewed up tight about the gauze, so tight that it is sometimes necessary to cut one stitch in order to remove the packing. Whenever pus is encountered either within the appendix or outside of it the wound is drained. Sometimes one or two narrow strips of gauze are sufficient, sometimes very many broad strips are required. Ordinarily all of the gauze is brought out at one point and between stitches which, as I have said, embrace it snugly. The gauze is used not only for drainage, but quite as much to stimulate adhesions between the coils of intestine which surround it and thus effectually shut off the general peritoneal cavity from its infected portion. The gauze is gently packed about the stump of the appendix, and should reach into every recess of the pus cavity. When the abscess is a large and ramifying one, or when there are several abscesses, we may bring the gauze packing out of the abdomen at more than one point in the wound.

These wounds are closed with mattress sutures; but the sutures are not always buried as they are in all uninfected

abdominal wounds which are completely closed and in which the danger of stitch infection is not so great. The stitches, where they are not buried, are prevented from cutting into the skin by pieces of rubber tubing or of gauze. These wounds should be stitched with great care. All of the divided tissues (the peritoneum excepted) should be included in each stitch unless the stitches are buried. Inasmuch as the muscles retract unevenly the sewing is sometimes a difficult task. If the wound is sewed in this way, and if sufficient care is exercised to avoid the infection of the stitches as they are being introduced and tied, there is little if any danger that a hernia will ensue.[*]

Even the point at which the gauze traverses the abdominal wall is not a weak one. A connective tissue membrane, the wall of the obliterated sinus, extends from the stump of the appendix to this point in the wound and binds the intestines to

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[*] See Johns Hopkins Hospital Bulletin, June–July, 1894.

[*] At the meeting of the Johns Hopkins Medical Society, November 5, 1894, I presented a case of appendicitis illustrating this method of the incision. Buried sutures of silver had been used in bring together the cut edges of the approximating muscles such as uninterrupted suture of silver ... the skin. The latter suture had already been withdrawn and a fine pink line indicated where the skin incision had been made. A little below the centre of the wound was the orifice of sinus from which a narrow strip of gauze had just been removed. The wound was three weeks old.

each other, and to the underside of the lips of the open part of the wound. The thickness of this membrane depends principally upon the length of time that the gauze is allowed to remain undisturbed. I have found it so strong after ten days that I could with difficulty thrust my finger through it. This membrane atrophies in time. After two years I have found the walls of a sinus to the gall bladder attenuated to little more than a trace.

With our present resources it is not justifiable to attempt to disinfect an abscess cavity of the peritoneum, no matter how infinitesimally small this abscess may be. Bull and two others, whose names I am not at liberty to mention, are probably not the only ones who have furnished disastrous instances of such attempts.

In operations for appendicitis we have always the strangulated stump of the appendix and usually tissues more or less necrotic in its immediate vicinity as a complication. My experiments* demonstrated conclusively the result of inoculation of strangulated tissues in the peritoneal cavity.

The problem is a very different one when we have an abscess in the cancellous tissue of bone or in highly vascular soft parts to deal with. We may safely close such abscess cavities. If, for example, the so-called pyogenic wall of an abscess in muscle is excised and the parts are then thoroughly washed with an antiseptic solution, we may so far inhibit the pyogenic organisms that the tissues or, if there is a dead space, the prolific granulations, assisted possibly by the blood, may altogether destroy them. In the cancellous tissue of bone a cavity large enough to hold a hickory nut becomes completely filled with granulations in about three days. Blood clots occupying such cavities, if inoculated with virulent cultures of staphylococcus aureus, rarely break down. As a rule, the so-called organization of the clot takes place in from two to four days without suppuration. But an abscess in the peritoneal cavity is a very different affair because (1) the wall of the abscess consists in part of strangulated or more or less necrotic tissue which we cannot excise; (2) attempts to disinfect such an abscess would probably be futile and might be worse than futile; (3) failure to disinfect might mean general peritonitis and the death of the patient, and not merely the retardation of healing.

There cannot be a definite incision for appendicitis. In general, if there is a large abscess, the incision should be made as near as possible to the crest of the ileum, so as to diminish the chances of entering the clean peritoneal cavity and to lessen the possibility of a hernia. The muscles are thick in this region, and when divided offer broad surfaces for coaptation by suture; and if the incision is too close to the ileum to admit

* The Johns Hopkins Hospital Reports. Report in Surgery, I.

of suture there is little danger of hernia resulting, as we know from a long experience with psoas abscesses, which we open by preference in this region. But the position of the abscess or, if there is no pus or too little pus to be detected, the position of the appendix in the given case should determine the site of the incision. If there is an abscess the tissues over it should be most carefully studied as they are being incised for signs of infiltration with inflammatory products. A little œdema of the deeper muscles (transversalis or internal oblique) may guide us to a circumscribed spot of adhesion of cæcum or omentum to parietal peritoneum and enable us to empty a large abscess without entering the uninfected part of the peritoneal cavity, or to thoroughly protect the intestines about the encapsulated pus cavity from the danger of infection before the pus is liberated. We place several yards of gauze between the healthy intestines and the abscess before opening the latter.

From a bacteriological point of view, we must often, if not always, inoculate the healthy peritoneum, but thus far we have not in a single instance had peritonitis supervene upon an operation for appendicitis, nor have we a single death to attribute to the operation. In the case of a large abscess, which we have evacuated without entering the uninfected peritoneal cavity, we still hesitate to search for and remove the appendix if its removal would necessitate our entering the clean peritoneal cavity.

When there is little or no pus to be discovered we make our incision directly over the appendix, which can usually be palpated. Here, too, we try to cut through thick muscles if possible. The instant that the peritoneum is opened, and before it is widely incised, we introduce large towels of gauze, and with these press the intestines over the appendix out of the way and towards the left. When the appendix is nicely exposed and a clear field for operation obtained, we introduce more gauze to serve as an inner lining to the outer ring of gauze. The adhesions which bind down the appendix are then slowly broken up by gentle finger pressure, and if pus is present it is caught as it leaks out by additional gauze sponges. If the inner layer of gauze packing should by accident become soiled it is immediately replaced by fresh packing, the opening into the abscess being meanwhile stopped with a gauze sponge. And so, little by little, the abscess is emptied, and finally the appendix removed. After ligating the appendix and its mesentery we may excise the mucosa which is cut off by the ligature. We never sew up the end of the stump in the infected cases, as some surgeons have advised. This would be a foolish waste of time; for the circulation of the part stitched has been cut off by the ligature applied to the appendix. The gauze for packing is rubbed full of a mixture of iodoform and bismuth and then sterilized.

THERAPEUTIC USE OF EXTRACT OF BONE MARROW.

By John S. Billings, Jr., *Assistant Resident Physician.*

The use of bone marrow in cases of anæmia and in certain diseases of the blood-making organs was probably suggested by the success of the treatment of myxœdema with thyroid extract. The marrow is thought by most authorities to be the principal seat of formation of the red blood corpuscles. A diminution in number of the red corpuscles may be due to increased destruction or to diminished formation, and it was hoped that in either case the administration of the marrow as a medicine would stimulate the blood-making organs to increased activity, and thus make up the loss in red corpuscles.

The first case of anæmia treated in this manner was reported by Fraser.[1] A diagnosis of pernicious anæmia was made, based upon the history of the case, the number of red corpuscles and per cent. of hæmoglobin, and the poikilocytosis of the red corpuscles. No mention was made as to the occurrence of nucleated red corpuscles, the presence of which in the blood in pernicious anæmia being a point upon which Ehrlich lays considerable stress. The case was given bone marrow with arsenic for the first two months, then bone marrow alone for a month, and finally bone marrow and iron for three months. In the first two months the corpuscles rose from 1,000,000 per cmm. to 4,000,000, ranging at the latter point until discharge, four months later.

Bigger[2] reports a case of leucocythæmia in a boy, which was treated with the bone marrow. There was rapid diminution in the size of the spleen and marked improvement within a week. No mention is made of any examination of the blood, and it is possible that the case may have been one of splenic anæmia or of the pseudoleukæmic infantile anæmia of Von Jaksch.

Danforth[3] reports a case of pernicious anæmia apparently cured by the use of bone marrow. Here also the report of the blood condition is incomplete, as only the number of red corpuscles and per cent. of hæmoglobin are stated. The latter rose from 35 per cent. to 80 per cent. The bone marrow in this case, as in that of Fraser, was given in combination with arsenic.

In our own cases the marrow was given in the form of a glycerin extract which was prepared in the following manner. Twelve sheep's ribs, carefully scraped, were chopped into small fragments and rubbed up in a mortar with one pound of glycerin. This was allowed to macerate for three or four days, being kept in a refrigerator during that time. It was then strained through gauze, and the resultant liquid administered in teaspoonful doses three times a day. No complaint was made by the patients with regard to its taste.

Case 1.—Chlorosis. Girl, aged 20 ; admitted June 21, 1894, complaining of dyspnœa and weakness. Past history was negative. Present illness of four months' duration. Physical examination

[1] Brit. Med. Jour., June 2, 1894.
[2] Lancet, September 22, 1894.
[3] Chicago Clin. Review, IV, 1894.

showed nothing beyond marked anæmia, and a loud functional murmur along the left sternal margin.

Blood count on admission, reds 2,898,000, whites 5600 ; hæmoglobin 32 per cent. Stained specimens of the blood showed nothing beyond the pallor of the centre of the red corpuscles, so characteristic of chlorosis. No treatment was instituted for the first ten days, *i. e.* until July 1st, when the extract of bone marrow was begun. The blood count at that time was, reds 3,198,000, whites 5500 ; hæmoglobin 38 per cent. The extract was discontinued July 16, as patient insisted on leaving the hospital. The blood count on the morning of discharge was, reds 4,192,000, white 7000 ; hæmoglobin 40 per cent. She was given Blaud's pills, and subsequently did well.

Case 2.—Chloro-anæmia in a boy. Past history was negative. For a month had complained of headache and gradually increasing weakness. Inspection showed a moderate grade of anæmia, physical examination being otherwise negative. On admission the blood count was, reds 3,290,000 per cmm. ; hæmoglobin 35 per cent. Stained specimens of the blood showed nothing beyond the pallor of the centre of the red corpuscles. Such a blood condition in a young female would certainly lead to a diagnosis of chlorosis, but the diagnosis of chlorosis in the male is always hazardous. The extract of marrow was ordered, and the condition of the blood gradually improved, the red corpuscles reaching a normal point (5,000,000 per cmm.) in about a month. The hæmoglobin rose more slowly, and on discharge (see chart 3) was only 68 per cent. As a rule, in chlorosis we must be satisfied if we can get the hæmoglobin as high as 75 to 80 per cent.

Case 3.—Pernicious anæmia. Man, aged 51, admitted June 15, 1894, complaining of vomiting and progressive weakness. He was very pale, and had first noticed the pallor ten weeks before. Had not lost very much in weight. Inspection showed a marked grade of anæmia, with the lemon-yellow discolorization of the skin so frequently seen in pernicious anæmia. Physical examination and examination of the stomach contents were negative. The case was at first suspected to be one of cancer of the stomach, but the absence of tumor, the readiness with which the gastric symptoms yielded to treatment, and finally the condition of the blood, all pointed to its being a case of the idiopathic anæmia of Addison, the so-called primary pernicious anæmia. Blood count on admission, reds 1,148,000, whites 4430 ; hæmoglobin 27 per cent. By July 1st the red corpuscles had sunk to 918,000, and the hæmoglobin to 17 per cent. Stained specimens showed marked poikilocytosis and polychromatophilic staining of the red corpuscles. Several nucleated red corpuscles seen, the greater number being normoblasts. The remainder were typical megaloblasts, with large pale nuclei and polychromatophilic protoplasm. Many micro- and megalocytes. A differential count of the leucocytes showed the per cent. of the small mononuclear forms or lymphocytes to be increased to 34 per cent., almost twice the normal. This technical description of the blood condition is given to show the grounds on which the diagnosis was based. The absence of any apparent causative factor, and the fact that the per cent. of hæmoglobin was relatively higher than that of the red corpuscles, confirmed the diagnosis. The use of the extract of bone marrow was begun June 30th. At first the blood condition improved, the red corpuscles rising to 1,400,000. They fell again to 970,000, however, and the extract was discontinued July 15th, it having been given (?) . . . . . . Fowler's solution was ordered in increasing doses, and the patient gradually improved, being . . . . condition. Blood count on discharge, reds 3,600,000, whites 7000 ;
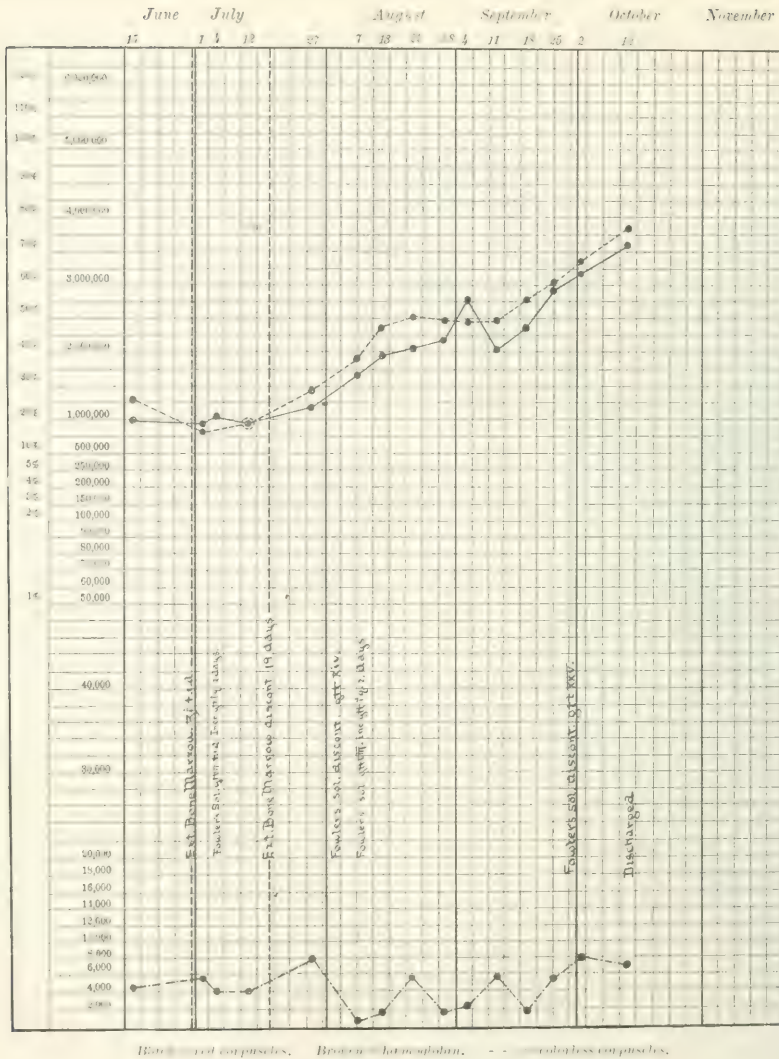
No. 1.　J. K.　Pernicious Anæmia.　Case 3.

hæmoglobin 69 per cent. Stained specimens showed no poikilocytosis, no nucleated red corpuscles, and the per cent. of the various forms of leucocytes was normal. (See chart 1.)

Case 4.— Pernicious anæmia. Man, aged 65, admitted August 15, 1894, complaining of weakness and shortness of breath. Illness began about one year before admission, and has been gradually progressive ever since. Has lost very little weight. Physical examination negative beyond a marked grade of anæmia. Skin distinctly lemon-tinged. The urine was high-colored, but of low specific gravity, a condition which has been frequently observed in pernicious anæmia, and which is supposed by Hunter to be due to the presence of pathological urobilin in the urine. The recent investigations of Hopkins (Guy's Hosp. Rep., 1893) would seem to make the existence of this substance improbable. He found only normal urobilin and hæmatoporphyrin in the urine in pernicious anæmia. Blood count August 18, reds 2.048,000, whites 5000; hæmoglobin 45 per cent. Stained specimens showed a moderate grade of poikilocytosis, such as is seen in severe secondary anæmia. No nucleated red corpuscles. Percentages of leucocytes normal. The number of red corpuscles gradually sank, and between September 8th and October 6th ranged between 1,120,000 and 1,392,000; during this time patient was taking Fowler's solution.

Stained specimens of the blood taken September 2d showed marked poikilocytosis, many micro- and megalocytes and many polychro-
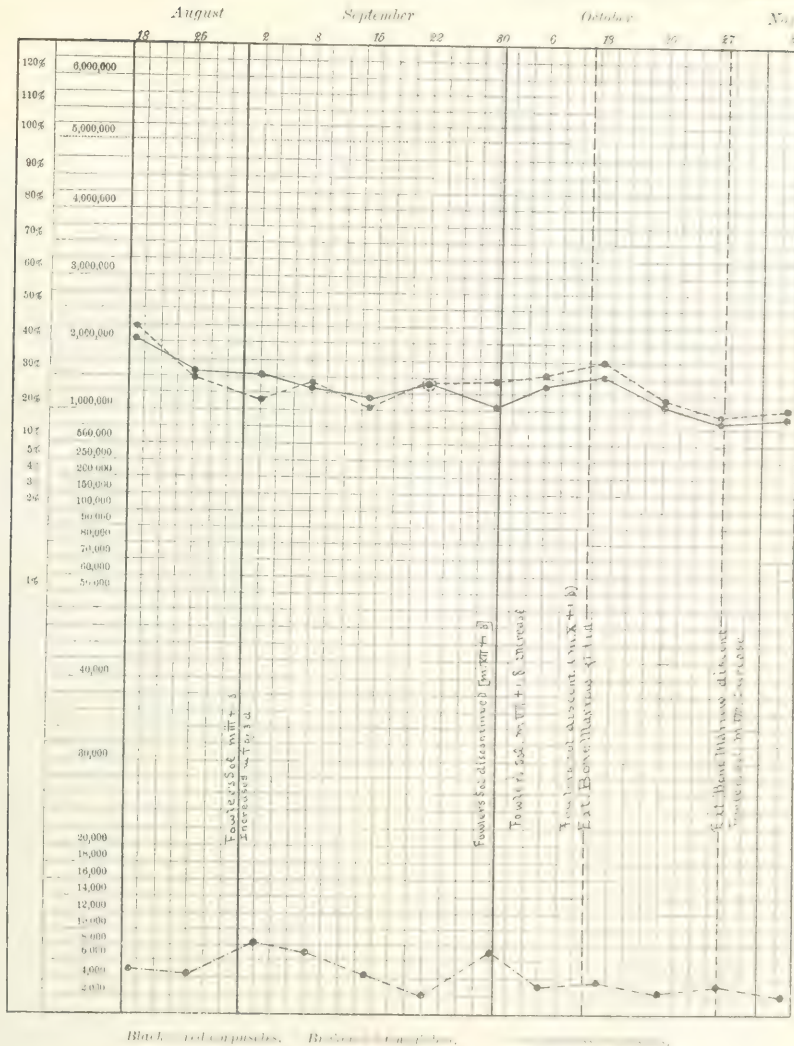
No. 2.   J. R.   Pernicious Anæmia.   Case I.

matophilic red corpuscles. A relatively large number of nucleated red corpuscles were seen, 80 per cent. of which were typical megaloblasts, the remainder being normoblasts. A differential count of the leucocytes showed the lymphocytes to be distinctly increased (26.5 per cent.). On October 6th the blood count was, reds 1,348,000, whites, 3000 ; hæmoglobin 31 per cent. Up to this time the patient had had two courses of Fowler's solution, but the physiological limit of the dose had not been reached. On October 10th the extract of bone marrow was ordered, the blood count next morning being, reds 1,550,000, whites 3500 ; hæmoglobin 35 per cent. The marrow was continued for two weeks, during which time the patient failed visibly, the red corpuscles sinking to 822,000 ; hæmoglobin 18 per cent. On October 27 the extract was discontinued and Fowler's solution in increasing doses was ordered.

Stained specimens of the blood, taken on Oct. 27th, showed an interesting state of things. While the poikilocytosis, or deformity in shape and size of the red corpuscles, was markedly increased, the nucleated red corpuscles had almost entirely disappeared, only one megaloblast being seen in four specimens. Such a disappearance of the nucleated red corpuscles from the circulation may be interpreted in two ways : either the blood condition has improved to such an extent that great activity on the part of the blood-making organs is no longer necessary, or it has deteriorated so much that new formation is no longer possible. The latter condition obtained in a case of total permanent hæmolithopsis reported by the writer in the Johns Hopkins Hospital Bulletin, May, 1891. Duchek has also reported such cases. In the present case this was also the condition that probably prevailed. Blood count Nov. 3d, reds

No. 3. J. H. CHLORO-ANÆMIA. CASE 2. E. S. CHLOROSIS.
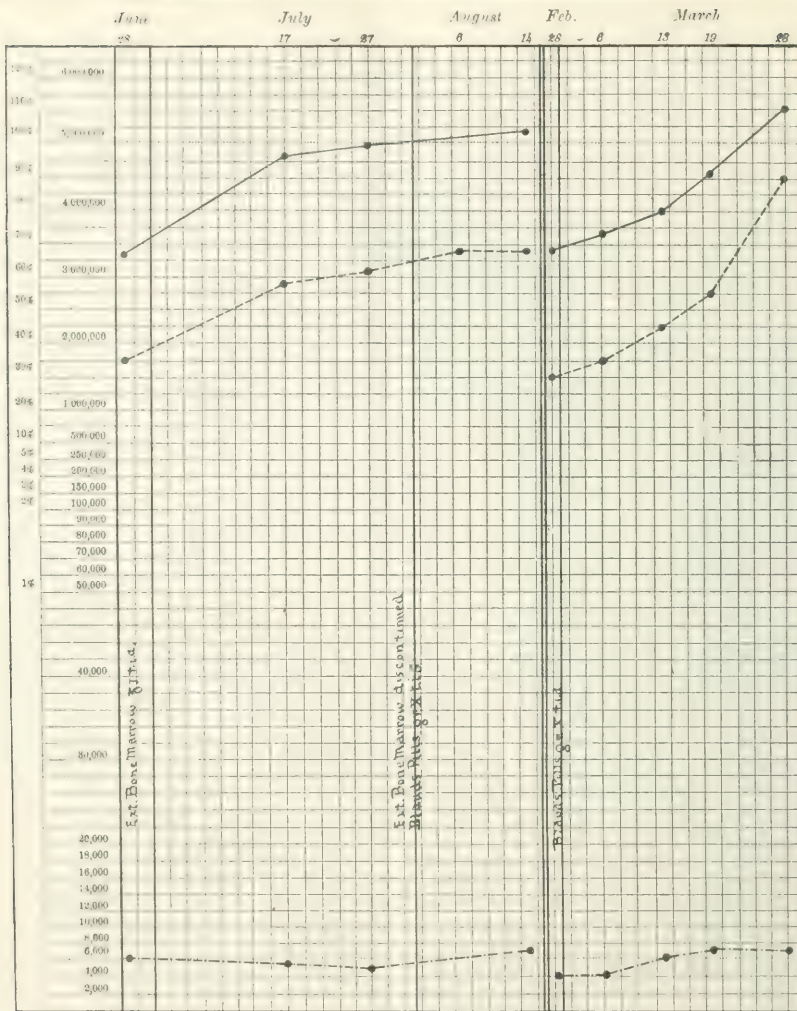
Black = red corpuscles. Broken = hæmoglobin. ... colorless corpuscles.

900,000, whites 2000; hæmoglobin 21 per cent. Stained specimens of the blood on Nov. 3d showed about the same condition of things as on Sept. 2d. The differential count of the leucocytes is so typical that it will be given in full:

Large.

Polynuclears. Lymphocytes. mononuclears. Transition. Eosinophiles.
52.1 per cent. 32.2 per cent. 2.4 per cent. 4.2 per cent. 6.1 per cent.

Nucleated red corpuscles again appeared in the blood in relatively large numbers, 59 being seen while making a differential count of 500 leucocytes.[*] This reappearance of the nucleated red corpuscles

[*] There is a very convenient method of expressing the number of nucleated red corpuscles found in a specimen of blood, but we must always take into consideration the number of leucocytes per cmm. For example, suppose case

may be taken as a relatively favorable sign, showing that the blood-making organs are once more active. If improvement occurs in this case under the use of arsenic it will be slow, as it requires some time to safely increase the dose to the physiological limit (20 to 25 min. t. i. d.). The general record of the case is given in chart 2.[†]

A shows 2000 leucocytes per cmm., and case B 6000. Now while making a differential count of 500 leucocytes in a stained specimen from A we see 12 nucleated reds, in a similar count in a specimen from case B we see only 4 nucleated reds. Yet the number of nucleated red corpuscles in the blood is about equal in the two cases, as in case B we cover only one-third of the ground that we do in case A.

[†] Since the above went to press this patient has died. A final blood count on Nov. 16, made 24 hours before death, showed only 700,000 reds, 1000 whites; hæmoglobin 17 per cent. No autopsy.

It will be seen that the two cases of chlorosis were benefited by the use of extract of bone marrow, while the two cases of pernicious anæmia were unimproved. It is difficult to understand how this remedy could be of service in cases of pernicious anæmia. Its effects can hardly be considered as analogous to those produced by thyroid extract in myxœdema. In the latter case there is atrophy of the gland, giving rise to defective secretion, so that there is an indication for attempting to supply this defect by the administration of thyroid extract. But the marrow in pernicious anæmia is, if anything, in a state of hypertrophy, and the condition is far more analogous to that of the hypertrophied and supposedly over-active thyroid gland in exophthalmic goitre than to that of the atrophied gland in myxœdema. Besides, there is no proof whatever that the marrow acts as a gland in the ordinary sense of the word. The formation of red blood corpuscles by the bone marrow cannot be properly termed a secretion, it being rather a process of cell multiplication and development, and there is no proof that this process is influenced in any way by any chemical product of the marrow itself. As regards the cases reported by previous observers, two things may be noted.

First, there is room for doubt that they were true cases of pernicious anæmia. Second, the patients were given arsenic together with the bone marrow. Now it is well known that some cases of pernicious anæmia do remarkably well on arsenic, and several instances of apparent cure have been reported. Such an improvement is shown in Case 3 of our series.

It is different as regards the use of bone marrow in chlorosis. The marrow contains iron in considerable quantity, and we may reasonably suppose that the glycerin extract contains sufficient iron in organic combination to be of service in chlorosis, a disease which yields so readily to iron in almost any form. Whether its value in such cases is greater than that of the various forms of iron used in medicine is doubtful. This is well shown in chart 3, where a blood chart of a case of chlorosis treated with Blaud's pills is given together with that of Case 2 of our series. The former does not suffer by the comparison. The conclusion is that the extract of bone marrow may be of value in cases of ordinary anæmia and chlorosis, such as would be benefited by iron in other forms, but that there is no proof of its being of value in cases of primary pernicious anæmia.

PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS HOSPITAL MEDICAL SOCIETY.

Meeting of October 1, 1894.

Dr. Kelly in the Chair.

Prof. J. J. Abel was elected Chairman for the coming year, and Dr. J. G. Clark was made Secretary.

Prof. W. D. Miller, of the University of Berlin, delivered an illustrated lecture in the amphitheater before an audience of Baltimore physicians and dentists, on "Some Points in Oral Pathology in Relation to Diseases of the Associated Parts and to general Diseases."

Meeting of October 15, 1894.

Dr. Abel in the Chair.

Case of Hereditary Chorea.—Dr. Osler.

Dr. Osler presented the case as illustrating a somewhat unusual feature in the family form of chorea, namely, the onset at a comparatively early age.

F. T., aged 28, a native of North Ware, N. H., was admitted Oct. 6, 1894, complaining of nervousness.

His father died at 59, after an illness of two weeks' duration. His mother died when 49 years old, of a disease similar to that with which he now suffers. She had nervous twitching for as long as he can remember. The trouble grew gradually worse, so that she could not move from her chair and she finally became bedridden. He does not think that any other members of his mother's family were affected. He has had four sisters and two brothers. One brother died at the age of 32, of influenza, after he had been afflicted for eight years with the same sort of disease as the mother. The other brother and the sisters are well and strong and have no muscular twitchings.

Personal History. As a child he had the usual disorders, but he was very well and strong until the eighteenth year. He had a comfortable home upon a farm, and though of a nervous temperament and troubled with weak eyes at times, he remained very well. He had an accident to the right elbow when he was fifteen years

of age. When seventeen he had occasional rheumatic pains in the joints, but which never kept him from work. He has never had gonorrhœa or syphilis.

The present trouble began when in his eighteenth year. It was first noticed as a very slight twitching of the arms and hands. The movements afterwards involved the other parts of the body—face, shoulders and legs. He thinks the latter were involved about eight months after the arms, and a little later the muscles of the face. The twitchings have persisted uninterruptedly to the present time. He has been able to work, however, until July of last year, but the involuntary movements now interfere with his doing manual labor. In 1888 he went to California for his health, having been troubled with a cough.

About three months ago he noticed that his speech was a little involved and he did not talk as readily as before. He complains that he now tires very easily.

The patient is a healthy-looking man, with normal temperature and pulse, and without any signs of trouble in the thoracic or abdominal viscera. There are movements of almost all the muscles. Those of the face are but little involved, though the angle of the mouth is occasionally twitched and the eyebrows elevated. On talking there is no special increase in the movements and articulation is not interrupted, but he says that he tires easily when he talks for any length of time. There is no tremor of the muscles of the lips or of the tongue. The head is lifted from the pillow without any tremor. There are constant, irregular movements of the trunk muscles, causing elevation of the shoulders or slight movement of the body. The arms and hands are moved in an irregular, purposeless manner, resembling closely the movements of chorea minor, though possibly a little slower. There is not a trace of incoordination on voluntary movement, and he can carry a glass of water to his lips quite steadily. As he sits quietly the legs are shifted or flexed, or the toes are drawn up. The gait is a little staggering, he hesitates as he starts, walking with a certain and swaying a little. There is no wasting of any of the muscle groups, no spasm, no rigidity, and no increase in the reflexes.

Dr. Osler referred to the fact that the peculiarity of the disease, progressive chorea described by Huntington was the late onset.

Huet, however, in his monograph, has noted seven instances in which the disease began before the 30th year, and in Hoffmann's patient the affection began at puberty. This patient does not know the date of onset in his mother's case, but as he says that she had it for many years before her death, it evidently started with her at an unusually early period, while his brother was affected before the 25th year.

Oliver Wendell Holmes.—Dr. Osler. [Published in the October Bulletin.]

Ureterotomy.—Dr. Kelly. [To appear in December Bulletin.]

Sarcoma in the Floor of the Mouth. Excision followed by Hypertrophy of the left Submaxillary Gland.—Dr. Bloodgood.

Dr. Bloodgood presented a case of excision of a sarcoma occupying the floor of the right side of the mouth, followed in two and one-half months by hypertrophy of the left submaxillary gland, suggesting before removal, metastasis. No return of the tumor had occurred ten months after operation.

This case is reported to the society chiefly for the unique and interesting enlargement of the left submaxillary gland, which was first noticed two months after the excision of the sarcoma, and which before its removal and microscopic examination suggested metastasis.

Surg. No. 2730, aged 46, admitted to the hospital Jan. 4, 1894.

The tumor had been noticed nine months. A few weeks before admission a cyst situated to the right and beneath the tongue had been opened at the dispensary and some milky fluid evacuated. A diagnosis of ranula was made. On admission a tumor could be felt to occupy the right half of the floor of the mouth, and a fungoid mass protruded above the teeth of the lower jaw, pushing the tongue to the left and upwards. This fungoid mass was removed. Microscopic examination showed it to be a mixed cell sarcoma, it containing large round and spindle cells.

At the second operation Dr. Halsted first performed tracheotomy, ligated the right lingual artery, and then excised the tumor in one piece with a piece of the lower jaw, part of the tongue and an area of healthy tissue. The wound healed by granulation, leaving as you now see a small sinus leading into the mouth, from which a little mucous membrane protrudes; after a sufficient time a plastic operation will be done to close this fistula.

Two and one-half months afterwards he returned with a small hard tumor, occupying the region of the left submaxillary gland, which was excised. Macroscopically it did not appear like the original tumor or a metastasis, but showed the typical appearance of a salivary gland between whose acini and ducts there had been a growth of new tissue. Microscopically the normal gland tissue was seen pressed upon by a new growth of fibrous tissue and lymphoid cells, the same picture that you will see under the second microscope, viz., a section from a tumor of the left submaxillary gland removed by Dr. Finney, in which the duct was occluded by a calculus. Both of these tumors were of about the same size and consistency ; the latter has more fibrous tissue and the glandular tissue shows more advanced atrophy. The calculus in the second tumor suggests that the cause of the first was an occlusion of the duct following the operation for the removal of the sarcoma.

It is now ten months since the sarcoma was excised and there is no return. Nor is there any evidence of metastasis elsewhere, the clinical and microscopic examination agreeing.

Dr. Welch.—I think there is no doubt that Dr. Bloodgood is correct in his interpretation of the two specimens under the microscope. The one in which the calculus lodged in the duct of the submaxillary gland is, of course, a specimen of chronic inflammation of the gland. That is not an uncommon result of the occlusion of the duct of any secreting gland. There is marked atrophy of the glandular substance ; the ducts and acini of the gland are fewer

in number, and the connective tissue is quite rich in small round cells. It is, of course, a remarkable coincidence that in this man with sarcoma of the tongue, the submaxillary gland should have enlarged and given rise to the suspicion that it was a metastasis. When one compares the microscopical sections he will at once be struck with the identity of the two. I should think it quite possible that in the operation the duct was cut off, or that afterwards it was closed by the cicatricial tissue. The appearance is so alike in both cases that one would be inclined to think that they were due to the same cause. There is atrophy of the gland tissue and subsequently a new formation of connective tissue. The usual explanation of this condition is that there is primarily a degeneration and atrophy of the glandular part and a secondary new growth of connective tissue. It belongs to the same group as certain cases of cirrhosis of the liver that follow occlusion of the bile-ducts with gall-stones, where we have a primary atrophy and degeneration of the liver tissue and a secondary growth of new tissue.

A Case of Typhoid Septicæmia associated with Focal Abscesses in the Kidneys, due to the Typhoid Bacillus.—Dr. Flexner.

Dr. Osler.—This case was of a great deal of interest clinically, belonging to a special group of typhoid cases in which the diagnosis is usually made of meningitis, either cerebral or cerebro-spinal. The patient, a colored girl, was admitted after two weeks' illness. She was delirious, had moderately high fever, and within a day after her admission she began to have retraction of the head and rigidity of one arm, and a general hyperæsthesia. There were no retinal changes ; the abdomen was somewhat swollen, and the spleen could be readily felt. It was impossible to say whether she had any rash or not. Until a day before her death we had no suspicion of typhoid. The history was very imperfect, and we regarded the case as one of meningitis—probably, as she was an emaciated colored girl, tuberculous in its nature.

Another very interesting peculiarity favored the view that it was tuberculous. After three or four days the fever fell and she had low and subnormal temperatures for four days before her death. The day before her death she developed a parotitis on the left side, and then Dr. Thayer suggested that the case was one of typhoid fever, although up to that time we had no suspicion of it. Her symptoms were entirely cerebral and cerebro-spinal—retraction of the head, muscular twitching, great rigidity of the right arm, and great increase in the reflexes. Had an autopsy not been made we certainly would not have been able to say definitely of what disease she died. Many of the cases of typhoid fever with cerebro-spinal symptoms are overlooked and put down in the death list as meningitis.

Dr. Flexner.—The results of the autopsy and the bacteriological study of the case, the clinical features of which Dr. Osler has just given you, leave no doubt as to its nature. The intestine showed several typhoid ulcerations, the first one being about 200 cm. above the valve. This one had a clean base. Larger ulcers occurred lower down, the largest being just above the valve and these presented a sloughy appearance. The large intestine also contained a number of small ulcerations. The mucous membrane of the intestine was greatly injected and actual hemorrhages had taken place into it.

The interest of the case centres in its bacteriological features. In the first place, it presents a rare condition, namely, a general infection of the body with typhoid bacilli. This organism was cultivated not only from the mesenteric glands, spleen, liver, bile, kidneys, lungs and bone marrow, but from the heart's blood itself, which contained it in considerable numbers.

In the kidneys there were a number of smaller and larger opaque white areas, the smaller hardly larger than a miliary tubercle, the larger measuring 4 mm. in width at the surface, beneath the capsule and extending downwards into the pyramids. These areas proved upon study to be definite abscesses. The contents, exam-

ined by means of cover-slip preparations, showed as the only organism present, bacilli having the form and staining properties of the typhoid bacillus. Cultures from such a nodule gave only the typhoid bacillus; and sections through the foci showed a purulent infiltration of the kidney substance corresponding to which many masses of bacilli could be distinctly seen. The bacilli occurred in clumps in the tubules, and they could be followed in several instances through the glomerular capillaries into the capsular space, whence they easily find their way into the tubules. The bacilli were easily demonstrated by means of Lœffler's methylene-blue stain, and they were readily and completely decolorized by Gram's method. In sections treated by the Gram method no other micro-organisms could be found. Had other organisms been present in these foci of suppuration they would doubtless have been demonstrable by one of the methods employed. Hence it seems that the objections urged so persistently by E. Fraenkel and Baumgarten against regarding the typhoid bacillus as a pus-producer, can in this instance be entirely excluded.

The means employed for the recognition of the typhoid bacillus in these cultures were those now regarded by most bacteriologists as sufficient to prove the identity of the organism. They were, in addition to the growths upon gelatine, agar-agar and potato, the milk, indol and fermentation tests. As you know, contrary to the B. coli communis, the typhoid bacillus does not coagulate milk, produce indol or ferment sugar.

Had the urine been examined in this case it is probable that the typhoid bacillus would have been found in it.

The parotitis mentioned by Dr. Osler was due to the streptococcus pyogenes which was present in the ducts and acini of the gland. There was a purulent infiltration of the gland.

Dr. Welch.—This is a very carefully worked out case and an important one. The question arises why in this case there should have been such a very large number of typhoid bacilli in the blood as to justify calling it a genuine septicæmia, whereas ordinarily there are no typhoid bacilli or so few demonstrable in the blood that no one would think of applying the term septicæmia to the disease. It is a well-known fact that human beings are much less subject to those bacterial infections which are common in lower animals in which the blood is crowded with myriads of these organisms. Now and then we do meet just such conditions in human beings, and this is an example. We have seen two or three cases of acute lobar pneumonia in which the blood was full of the lanceolate diplococci of pneumonia, just as it is in an inoculated rabbit. In this instance we may imagine one of two things to have existed, either that the typhoid bacillus was of very unusual virulence so that it could overcome the bactericidal power of the blood, or, what is more probable, that something had altered the bactericidal power of the blood so as to admit of the multiplication of the typhoid bacillus in the blood. The reason that the typhoid bacillus does not flourish in the blood is that the human blood is distinctly germicidal to it. If you inoculate fresh human serum with typhoid bacilli, thousands of the bacteria are quickly killed. We may therefore suppose that something has destroyed the bactericidal power of the blood. I would refer here to a communication that was made to this society last year on the action of rattlesnake poison on this very property of the blood, in which it was shown that the venom of the rattlesnake destroys the bactericidal power of the blood so that ordinary putrefactive bacteria will multiply readily in that fluid.

This case is, moreover, a conclusive one that the typhoid bacillus is capable of producing genuine abscesses. That is a matter very much disputed, especially by E. Fraenkel and Baumgarten.

As regards the very long viability of the typhoid bacillus in the human body, we have the best examples in those cases of periostitis and osteomyelitis which occur many months and even years after typhoid fever. One of the first observations as to the long duration of life of the typhoid bacillus in the animal body was made

by Dr. Blachstein, in my laboratory, in his experiments on animals, where we found that the typhoid bacillus survived in the bile of inoculated animals at least four months. Those cases of post-typhoid osteomyelitis in which genuine pus is present are usually mixed infections. Most of the abscesses in which the typhoid bacillus has been found have also been mixed cases. There are some cases of abscesses due to the typhoid bacillus exclusively, however, which stand the most severe criticism.

On the Presence of Iron in the Granules of the Eosinophile Leucocytes.—Dr. Barker. (See Bulletin for October, 1894.)

Dr. Abel.—How long was the specimen exposed to the ammonium sulphide solution, and how strong was the solution?

Dr. Barker.—This specimen was prepared in the following way: Hydrogen sulphide was passed through ordinary liquor ammonia over night. A drop of this solution was placed on a coverslip which had been heated one and a half hours; a drop of glycerine was placed on the slide, and then the cover-glass placed upon the glycerine. When placed in the thermostat at 60° C. the glycerine keeps the solution from evaporating, and it can be left for weeks without drying. The reaction in this case appeared in six hours after treatment; that is, I looked at this at the end of six hours and it was sharply stained.

Dr. Abel.—I think this is a very interesting communication in many ways. It is of great importance to localize chemical reactions in a morphological way, and Dr. Barker has made an important contribution to the physiology of the blood with respect to these granules. We can only make conjectures in regard to the nature of the organic constituent of this iron compound; most likely, however, this constituent is of a proteid nature. There are many iron albuminates which give the ammonium sulphide reaction at once. Then again there are other albumin compounds which are decomposed by ammonium sulphide with more difficulty, requiring a longer time. The liver contains such a compound. Schmiedeberg has recently published a paper on organic compounds in which he says that if sections of the liver be exposed to ammonium sulphide solutions for some time (some period of time longer than the ordinary ferric albuminates require) they blacken, and calls attention to the fact that this is a proof of a more intimate union between the iron and the proteid constituent than is the case in the ordinary ferric albuminates. The iron is in organic combination. The liver seems to have a great amount, more than any other organ, of this proteid iron compound. An iron compound identical with that contained in the liver has been made synthetically by Schmiedeberg and his pupil Marfori. It contains as high as 8 per cent. of iron. Bunge's earlier compound, isolated from the yolk of eggs and called hæmatogen, behaves like the ferratin of Schmiedeberg in being only slowly decomposed by ammonium sulphide. It is, however, a nucleo-compound, contains only 29 per cent. of iron, a little less than is contained in hæmoglobin, and is undoubtedly a more or less direct precursor of the hæmoglobin of the chick's blood. From the standpoint of physiological chemistry it would be most interesting to know more of the nature of the iron-containing compound shown by Dr. Barker to exist in the eosinophilic granules.

NOTES ON NEW BOOKS.

PHYSIOLOGICAL PAPERS OF PROF. MARTIN.

It is proposed to collect the physiological papers and addresses of Professor Martin and publish them as one of the memoirs of the Biological Laboratory of the Johns Hopkins University. This plan has been adopted in response to a suggestion from a number of his former pupils, that the long and valuable services of Professor Martin to the University and his brilliant contributions to American physiology and biology should be commemorated by a memorial of

some kind. After consultation with a number of his friends it has been decided that the most appropriate form of memorial will be the publication in a handsome volume of his scientific papers and addresses. We hope to raise a fund among his friends sufficiently large to meet the cost of an edition of about 300 copies. One copy will be sent to each person or institution subscribing ten dollars, and, if desired, an extra copy for every additional ten dollars subscribed. A brief statement will be made upon the reverse of the title-page or elsewhere, to the effect that the volume is published by his friends and former pupils, and probably a list of subscribers will be appended. As the work will be placed at once in the hands of the printer, it is requested that subscriptions be sent promptly, in the form of checks or money orders made payable to Professor W. H. Howell, Johns Hopkins University, Baltimore.

The following provisional list contains the titles of papers which will appear in the collection; they are here arranged in chronological order:

Notes on the structure of the olfactory mucous membrane. [*Studies from the Physiological Laboratory in the University of Cambridge, Part I*, 1873.]

The study and teaching of Biology. [*Popular Science Monthly, Jan.*, 1877.]

The normal respiratory movements of the frog, and the influence upon its respiratory centre of stimulation of the optic lobes. [*Journal of Physiology*, 1878.]

The influence of stimulation of the mid-brain upon the respiratory rhythm of the mammal—with W. D. Booker. [*Journal of Physiology*, 1878.]

On the respiratory function of the internal intercostal muscles——with E. M. Hartwell. [*Journal of Physiology*, 1879.]

The physiology of secretion. [*Annual address delivered before the Medical and Chirurgical Faculty of Maryland, April 9*, 1879.]

A self-feeding chronographic pen. [*Studies from the Biological Laboratory, J. H. U.*, 1880.]

Observations upon the mean pressure and the character of the pulse wave in the coronary arteries of the heart—with W. T. Sedgwick. [*Journal of Physiology*, 1881.]

A new method of studying the mammalian heart. [*Studies from the Biological Laboratory, J. H. U.*, 1881.]

Observations on the direct influence of variations of arterial pressure upon the rate of beat of the mammalian heart. [*Studies from the Biological Laboratory, J. H. U.*, 1882.]

The direct influence of gradual variations of temperature upon the rate of beat of the dog's heart. [*Croonian Lecture, Philosophical Transactions of the Royal Society, London*, 1883.]

The action of ethyl alcohol upon the dog's heart—with L. T. Stevens. [*Studies from the Biological Laboratory, J. H. U.*, 1883.]

Modern physiological laboratories: What they are and why they are. [*University Circular*, 1884.]

The study of the physiological action of drugs. [*Annual address delivered before the Medical and Chirurgical Faculty of Maryland*, 1885.]

Preliminary account of experiments in regard to the circulatory and respiratory changes observed in animals placed in the pneumatic cabinet—with F. Donaldson. [*New York Medical Journal*, 1886.]

Experiments in regard to the supposed "suction pump" action of the mammalian heart—with F. Donaldson. [*Studies from the Biological Laboratory*, 1887.]

Some thoughts about laboratories. [*Address delivered at the opening of the Hoagland Laboratory, Brooklyn*, 1888.]

Some observations on the effect of light on the production of carbon-dioxide gas by frogs—with J. Friedenwald. [*Studies from the Biological Laboratory*, 1889.]

On the temperature limits of the vitality of the mammalian heart—with E. C. Applegarth. [*Studies from the Biological Laboratory*, 1890.]

Vaso-motor nerves of the heart—with D. J. Lingle. [*Transactions of the Medical and Chirurgical Faculty of Maryland*, 1891.]

Some experiments as to the physiological effects of "differential respiration"—with G. P. Dreyer. [*Studies from the Biological Laboratory, J. H. U.*, 1893.]

A Practical Manual of Mental Medicine. By Dr. E. Régis, Professor of Mental Diseases, Bordeaux. With a preface by M. Benjamin Ball. Second edition, thoroughly revised and largely rewritten. Authorized translation by H. M. Bannister, A. M., M. D. (*Utica, N. Y.: Press of American Journal of Insanity*, 1894.)

As the author pleasantly remarks in his introduction to the American translation, "It is the first instance of a work treating of mental alienation, written by an alienist, translated by an alienist, and, under the direction of an alienist, printed and bound by the insane." The book is a good one, well translated and neatly and tastefully printed. It is modestly called by the author a "Manual," but it is much more than that, and is indeed a full and satisfactory text-book. As a rule, the definitions are clear and self-explanatory, but occasionally they seem open to the charge of over-refinement. Take for example the attempt to show a difference between mental alienation and insanity. Mental alienation, according to the author, is "the total of pathological conditions essentially characterized by disorders of the intelligence," while insanity "is a special disease, is a form of alienation characterized by the accidental, unconscious and more or less permanent disturbance of the reason." According to this reasoning, mania and many conditions of paranoia are not insanity. In our opinion it is impossible to distinguish in this manner between disorders of the *intelligence* and disorders of the *reason*. Disorders of the intelligence, of the emotions and of the will are to be considered insanity equally with disorders of the reasoning powers.

It is gratifying to perceive that he places among the causes of insanity solitary confinement. The effect of this form of prison life is unmistakably to produce insanity, and it should be more frequently recognized by alienists. His characterization of a remission as an attenuation of the disease is a happy one and commends itself to all who have seen cases of circular insanity. The chapter on pathological anatomy is unsatisfactory and does not adequately represent our present state of knowledge.

The chapters on the "Degeneracies of Evolution," "Degeneracies of Involution," and "Insanities associated with Physiological Conditions," are especially valuable. The subject-matter has not been as clearly presented in English before.

The book should be in the hands of every physician who sees cases of insanity.

THE JOHNS HOPKINS HOSPITAL REPORTS.

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Professor of Gynecology in the Johns Hopkins University and Gynecologist to the Johns Hopkins Hospital.

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CONTENTS.

A CONTRIBUTION TO OUR KNOWLEDGE OF ORGANIC SULPHUR COMPOUNDS IN THE FIELD OF ANIMAL CHEMISTRY.[1]

BY JOHN J. ABEL, M. D., *Professor of Pharmacology.*

(*From the Pharmacological Laboratory of the Johns Hopkins University.*)

It is well known to workers in the field of animal chemistry that when freshly voided dog's urine is shaken up with milk of lime, or is made thoroughly alkaline with sodium or potassium hydrate, a peculiar, penetrating, offensive odor is developed; but beyond the merest passing references, nothing can be found in literature regarding the compound yielding this odor, and nothing seems to have been done toward determining its nature. Thus,[2] Böhm and Lange, discussing the applicability of Schlösing's method to the determination of ammonia in the dog's urine, remark that the addition to the urine of milk of lime gives rise to a peculiar, penetrating, garlicky odor, filling the whole bell-jar even after the lapse of 48–72 hours. V. Knieriem[3] makes a similar reference, but no one has gone farther than to note the presence of this odor.

There are many substances known to chemistry which may be said to have a penetrating, offensive, stupefying, and in some cases, garlicky odor. Among these are the mercaptans, the organic sulphides, selenides and tellurides, the phosphines and the isocyanides, but in the present instance no help was derived from the smell in identifying the body, as no one whose judgment was asked in the matter could state positively that the odor was like any other known to him.

I was obliged to direct my first efforts toward gaining some notion of the ultimate qualitative composition of the body. To this end I proceeded as follows: Air from an ordinary large glass gasometer was made to bubble through two liters of urine to which about 100 cc. of thick cream of lime had been added, and the whole thoroughly agitated for a few moments, and this air, laden with the odorous substance, was forced through an empty wash bottle, then through two Muencke's wash bottles made entirely of glass, each containing a 10 per cent. solution of hydrochloric acid, then through two similar wash bottles filled with a 40 per cent. solution of sodium hydrate, then through an empty bottle, and then through a piece of combustion tubing 60 centimeters long, filled in its middle third with asbestos fiber which had previ-

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[1] The substance of a paper with the title : "On the occurrence of ethyl sulphide in the urine of the dog; on the behavior of ethyl sulphide dissolved in concentrated sulphuric acid toward oxidizing agents, and on certain reactions for the detection of alkyl sulphides," appearing in the December number of the Zeitschr. f. physiol. Chemie.

[2] Archiv f. exp. Pathol. u. Pharmakol., Bd. 2, p. 368.

[3] Zeitschr. f. Biol., Bd. X, p. 269.

ously been heated piece by piece to a white heat in the flame of a Barthel's alcohol blast-lamp. Pure oxygen taken from an Elkan's cylinder and well washed by being made to pass through both acid and alkali, was forced into the tube containing the purified asbestos at the point where the air laden with the odoriferous body entered it.

From the tube filled with the asbestos the current of air was next passed into a Geissler potash bulb half filled with a 2 per cent. solution of the purest hydrate of sodium. With the apparatus arranged as described, the combustion tube containing the asbestos was kept at a red heat in a short four-burner furnace for five hours, the air and oxygen passing at about the rate that is usual in combustion analyses.

At the end of this time a portion of the sodium hydrate solution in the Geissler bulb was acidulated with hydrochloric acid and tested with a few drops of a solution of barium chloride, with the result that an immediate precipitation of barium sulphate occurred. It may here be noted that the air current after it had passed the heated tube turned a blue litmus strip red, whereas it had no action on litmus before being heated, thus demonstrating that the sulphur of our compound had been turned from a neutral into an acid combination. A blank experiment in which the urine was replaced by distilled water was carried on for six hours, but in this case the sodium hydrate yielded no trace of sulphate. Our conclusion must therefore be that the volatile, odoriferous compound contains sulphur.

At this point two questions present themselves: First, can this sulphur compound be referred for its origin to the action of the hydrate of calcium upon one of the known so-called "neutral" sulphur compounds of the urine, such as cystin and allied compounds, or such as hyposulphurous, sulphocyanic or mercapturic acids?

Second, does the air after passing through the system of wash bottles used in the combustion experiment, contain any other substances than this odoriferous compound?

The first question can be answered with considerable certainty by the method of exclusion. Cystin does not seem to be decomposed by treatment with milk of lime at room temperature. Baumann and Brenziger [2] have shown, however, that when ethyl cysteïn is heated with a free alkali, ethyl mercaptan is split off. M. v. Nencki [3] was the first to demonstrate that the nauseating odor of the urine after asparagus has been eaten is due to methyl mercaptan, and also that methyl mercaptan is one of the products of the bacterial decomposition of proteids.[4] Karplus [5] has also found methyl mercaptan in the urine as the product of a special bacterium, and L. v. Nencki [6] finds that it is always present among the gases of the large intestine. Because, then, of the proved occurrence of mercaptans in animal fluids, one cannot neglect making the proper tests for them where an offensive, not strictly definable odor is

met with. But in the case under consideration the making of such tests will be seen to be unnecessary, for the very process of setting free our odoriferous compound with alkalies would have bound the mercaptans and prevented them from leaving the bottle, and an impassible barrier would also have been found in the wash bottles filled with sodium hydrate.

As for the other neutral sulphur compounds of the urine, the acids above mentioned, it may be remarked that the calcium and alkali salts of at least one of them, sulphocyanic acid, is stable and therefore could not come in question. The alkali salts of hyposulphurous acid are readily soluble and stable; the calcium salt is equally soluble but unstable.

Now, to exclude hyposulphurous acid as a possible source of the sulphur found in our combustion experiment, we have only to state that this experiment yielded the same result when fixed alkali instead of milk of lime was used to free the odoriferous substance. But even with the employment of calcium hydrate it seems hardly possible for sulphur dioxide to escape from a fluid containing such an excess of lime.

As to the mercapturic acids being a possible source of our sulphur compound, we have only to note Baumann's [1] discovery that when they are decomposed with alkalies mercaptans are split off, a fact that has been adopted into the methods of urinary analysis. But we have demonstrated that it would be impossible for a mercaptan to pass over into the combustion tube. A further proof that excludes both the mercaptans and also sulphureted hydrogen is seen in the fact that two strips of filter paper moistened with alkaline lead solution and placed, the one between the bottle of urine and the first wash bottle, and the other between the last wash bottle and the combustion tube, never showed the slightest change of color.

It is therefore fair to conclude that our sulphur compound is not a derivative of one of the known "neutral" sulphur compounds of the urine, but that it is split off by the milk of lime from a still unknown sulphur compound of the urine.

We now turn to the second question: Does the air after passing through the system of wash bottles used in the combustion experiment contain any other substance besides this odoriferous compound? If we bear in mind the contents of the series of wash bottles, it will be seen that no substance with acid or basic properties could have passed them; in other words, that only a chemically indifferent substance could have been found with the sulphur compound at the end of the series of bottles. This disposes not only of the mercaptans, but of all the various compounds spoken of in the beginning as having an odor similar to the compound in question, with the sole exception of the organic sulphides.[2]

The phosphines, too, are excluded, for, being basic substances,[3] they would be held back by the hydrochloric acid. Then, too, the phosphines are very readily oxidized, and in

[1] Salkowski: Archiv f. path. Anat. u. Physiol., Bd. 58, p. 472.

[2] Zeitschr. f. physiolog. Chem., Bd. 16, p. 565.

[3] Archiv f. exp. Pathol. u. Pharmakol., Bd. 28, pp. 206-209.

[4] M. v. Nencki and N. Sieber: Monatsh. f. Chemie, Bd. 10, pp. 526-31.

[5] Archiv f. pathol. Anat. u. Physiol., Bd. 131, pp. 210-222.

[6] Sitzb. d. kais. Akad. in Wien, Mathem. Classe III, Abth. 98, pp. 437-8.

[1] Baumann: Zeitschr. f. physiolog. Ch., Bd. 8, p. 194.

[2] The selenides and tellurides are obviously out of the question as constant products of animal metabolism, but see a late interesting paper by F. Hofmeister in Arch. f. exp. Pathol. u. Pharmakol., Bd. 33, p. 198, on the ability of the organism to form the nauseating methyl telluride and selenide on the introduction of selenium and tellurium or the salts of their acids.

[3] With the exception of the primary phosphines.

small amounts could not be made to bubble up through so many wash bottles without being destroyed by this long contact with the air. A long series of experiments was, in fact, undertaken to determine whether or not a volatile phosphorus compound was present along with the sulphur compound *before* it was washed, but all with negative results.

It therefore seemed fair to assume that our sulphur compound was the only substance carried by the air through the series of wash bottles, and all the subsequent experiments made to establish its identity furnish additional support for this assumption.

SOLUTION OF THE COMPOUND IN CONCENTRATED SULPHURIC ACID, AND PROPERTIES OF THIS SOLUTION.

A series of experiments was next undertaken to determine how this sulphur compound could be collected in sufficient quantities for study and analysis. It was finally found that concentrated sulphuric acid completely absorbed the body and the resulting solution is without color and also without odor, unless the air current is allowed to bubble through the sulphuric acid for several days, when a faint oniony smell is perceptible. In concentrated sulphuric acid we have then a means of storing considerable quantities of this sulphur compound.

Chapman suction pumps were used to draw air through large flasks containing urine and milk of lime, then through two wash bottles containing a 10 per cent. solution of hydrochloric acid, then through two wash bottles filled with a 40 per cent. solution of sodium hydrate, then through a U tube 12 inches high and 1 inch in diameter filled with pieces of potassium hydrate, then through two similar U tubes filled with granular calcium chloride, and from this last tube the air laden with the sulphur compound passed through a Geissler bulb or through a small wash bottle containing concentrated sulphuric acid. The connections between the bottles were glass to glass held in place by the best black English tubing. Two such circuits were usually kept at work by the same suction pump, and the pump was operated day and night. After about 72 hours, in which time 15–20 liters of dog's urine had been exhausted of the sulphur compound, the Geissler bulb containing sulphuric acid was replaced by another. On diluting with water some of this concentrated sulphuric acid that has been charged with the body, or on neutralizing it with free alkalies, or on the addition of almost any metallic salt at hand, an intense odor like that of one of the organic sulphides pervades the room. These properties of dissolving in considerable quantities in sulphuric acid and of forming with it a nearly or quite odorless solution, and of being set free unchanged on dilution with water or on neutralization of the sulphuric acid, are possessed, so far as I know, by the sulphides[1] only among organic sulphur compounds. I have repeatedly dissolved 10 or 12 grams of ethyl sulphide in 100 cc. of concentrated sulphuric acid, having previously cooled both fluids, and found that the resulting solution had no odor whatever, but on adding to this solution half its weight of water, or,

better still, of ice, the ethyl sulphide soon appeared floating on the top of the diluted sulphuric acid. Dimethyl sulphide and methyl ethyl sulphide were found to behave in the same way. Reference books on chemistry do not mention this property, and it was only after the completion of my experiments that I learned that this method is employed in refining crude Ohio petroleum, and that Mabery and Smith[1] had by its help recovered alkyl sulphides from the "distillates of crude petroleum."

OXIDATION OF THE URINARY SULPHIDE.

The alkyl sulphides are readily oxidized to the fluid sulphoxides, and then further to the very stable crystalline sulphones. Thus, if ethyl sulphide, $(C_2H_5)_2S$, is oxidized with nitric acid, specific gravity 1.2, ethyl sulphoxide, $(C_2H_5)_2SO$, is produced, a thick, unstable fluid, easily soluble in water. If, however, fuming nitric acid is used, then diethyl sulphone, $(C_2H_5)_2SO_2$, results, which crystallizes in large rhombic plates very soluble in water, melting at 70° and distilling at 248° without decomposition. The sulphoxides have the property of being reducible with zinc and sulphuric acid to the original sulphide. The sulphones, however, are very stable substances, unaffected by treatment with zinc and sulphuric acid. It was hoped that oxidation of the concentrated sulphuric acid solution of the sulphide from the dog's urine with potassium permanganate would yield a sulphone, the composition and properties of which would determine which particular sulphide we were dealing with. Accordingly, about 100 cc. of a concentrated sulphuric acid solution containing the sulphur compound collected from about 25 liters of dog's urine was treated in the following manner: A beaker containing it was placed in pounded ice, and from time to time were added a few drops of a concentrated aqueous solution of potassium permanganate, also cooled to 0° C. When the permanganate ceased to be decolorized, a cold 4 per cent. solution of sulphuric acid was slowly added until the acid in the beaker was reduced in strength to about a 20 per cent. solution. The whole was then heated on the water-bath, while potassium permanganate was again added.

Under the influence of the heat an additional quantity of the permanganate was reduced, and the heating on the water-bath was kept up as long as any permanganate was decolorized.

The slight excess of permanganate, when reduction no longer occurred, was removed by the addition of a little sodium formate.

The solution was then made alkaline with potassium hydrate, evaporated till crusts of potassium sulphate formed; the potassium sulphate filtered off, again concentrated, again filtered, and now evaporated to dryness. The dry residue was extracted with a little absolute alcohol, half of the extract evaporated on the water-bath, and the crystallized mass examined.

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[1] In all probability, however, the analogous selenides and tellurides behave in the same way toward concentrated sulphuric acid.

[1] Americ. Chem. Journ., Vol. 13, p. 243, and Vol. 16, p. 38. R. H. Smith has also treated ethyl sulphide with concentrated but still sulphuric acid diluted with much water and neutralized with barium carbonate for the purpose of forming barium-ethyl-hyposulphite, but makes no mention of the separation of the sulphide on dilution with water. Journ. of the Chem. Soc., 22 (1869), p. 302.

spontaneously. A small quantity of a deliquescent compound remained. To remove all trace of potassium carbonate, the residue was extracted a third time with absolute alcohol, and the alcohol again evaporated. On the addition of dilute sulphuric acid to some of the deliquescent residue, the odor of acetic acid became very apparent. The characteristic odor of acetic ether was at once brought out on gently heating with the addition of concentrated sulphuric acid and alcohol, and the addition of ferric chloride to a neutral solution gave the characteristic blood red color of a solution of ferric acetate. These properties, viz., the deliquescence of the potassium salt, the odor of the free acetic acid and of its acetic ether, and the color of its ferric salt, leave no doubt of the occurrence of acetic acid as an oxidation product of the sulphur compound under examination. I was unprepared for this outcome, as I had hoped to secure a sulphone. On the supposition that a little of the sulphone might yet be mixed with the acetate, I acidulated its aqueous solution with sulphuric acid, drove away the acetic acid as far as possible on the water-bath, and again extracted the dry residue with alcohol, but only a trace of potassium acetate and sulphate was taken up. I now repeated the oxidation experiment twice over, making slight variations in the method, such as the employment of finely powdered potassium permanganate instead of an aqueous solution, and sodium instead of potassium hydrate, in the neutralization. I used also a little less than the necessary amount of permanganate, so as to avoid the after-use of sodium formate, but the final outcome was the same as before: an acetate again appeared.

A blank oxidation experiment was next undertaken in order to determine whether the reagents used contained any thing oxidizable to acetic acid, but not a trace of acetate was found.

We may therefore safely conclude that our sulphur compound contains one or two ethyl groups. It is not easy to draw conclusions as to the presence of a methyl group in the sulphide, as such a group would have been oxidized to carbon dioxide and water. Carbon dioxide is, in fact, given off when the acid solution and permanganate are boiled, but this can be referred to the destructive oxidation of some of the sulphide, for it also takes place when synthetically prepared diethyl sulphide is treated in the same way.

OXIDATION OF SYNTHETICALLY PREPARED ETHYL SULPHIDE UNDER THE SAME CONDITIONS.

It was now in order to compare the behavior of synthetically prepared ethyl sulphide with our sulphide. Accordingly, a preliminary experiment was first made as follows: Five grams of ethyl sulphide, which distilled at 91.9°–92° C., were dissolved in 50 cc. of sulphuric acid, and oxidized by adding small quantities of powdered permanganate very gradually to the concentrated sulphuric acid kept in a freezing mixture, an hour and a half being consumed in adding 12 grams. When too much was added at one time, a flash of light would appear, showing that some of the sulphide was being completely oxidized, and the odor of ethyl sulphide also became apparent. 25 cc. of cold concentrated sulphuric acid were now stirred into the mixture, and from time to time

small portions of a concentrated aqueous solution of permanganate were added together with about 20 cc. of water. A colorless solution of an oniony odor now resulted and this was slowly diluted with water up to a liter, permanganate still being added. The solution was then boiled for a short time and as the permanganate was still being reduced, more was added. When no more permanganate was reduced about 200 cc. of the fluid was distilled off. This distillate, which was plainly acid, was caught in a little strong potassium hydrate and subsequently enough more hydrate was added to give a neutral reaction, and it was then evaporated on the water-bath. There was obtained a small quantity of a deliquescent salt consisting of potassium carbonate and potassium acetate, which gave the reactions that we have already mentioned as sufficient to identify acetic acid. In a similar experiment it was observed that when the distillation was undertaken before the oxidation was complete, that is, at a time when the permanganate was still being reduced, the distillate had a most disagreeable odor, reminding one both of onions and of acetic acid. Also when evaporated to dryness with an alkali, it gives all the reactions of a sulphite, viz., it reduces permanganate, it yields sulphureted hydrogen on reduction with zinc and sulphuric acid, it decolorizes an iodine starch solution, it gives a red color to a weak solution of sodium nitroprusside, and it gives off the peculiar stinging odor of sulphur dioxide on acidulation with sulphuric acid. In such a case, therefore, one must first oxidize the sulphurous acid with permanganate before undertaking the tests for acetic acid or the preparation of one of its salts. When boiling is resorted to in order to hasten the progress of the oxidation, it is found that much carbon dioxide is given off. It is evident that in the above experiments the greater part of the sulphide was oxidized to the end products, sulphuric anhydride, carbon dioxide and water.

As, to my knowledge, the alkyl sulphides have hitherto only been oxidized to sulphoxides and sulphones, and not as in the manner indicated above, to acetic and sulphuric acids, it seemed worth while to attempt the quantitative oxidation of ethyl sulphide to these latter products. Accordingly, 12 grams were dissolved in 100 cc. of concentrated sulphuric acid, the latter being cooled in a freezing mixture; 65 grams of finely powdered permanganate, somewhat less than the quantity theoretically necessary to oxidize the sulphide to acetic and sulphuric acid, were then dissolved in 200 cc. of cold sulphuric acid, and this solution was slowly added to the cold solution of the sulphide. The permanganate was at first entirely decolorized and none of the sulphide was liberated or destroyed, but toward the end of the operation, as more and more of the oily heptoxide of manganese from the bottom of the beaker came to be added, the black mixture began to foam up, flames now and then shot forth and much carbon dioxide was given off. A repetition of the experiment led to no better results. In both cases, however, water was added to the black, agitated mass, and after diluting to about a liter, the odor of acetic acid became plainly perceptible. When diluted to several liters and distilled, a little of the distillate treated as before gave all the tests for acetic acid. A little silver acetate was also produced which crystallized out of water in

long, shining needles, gave off fumes of acetic acid, deposited silver on gentle incineration, and also emitted the odor of ethyl acetate on treatment with concentrated sulphuric acid and alcohol.

On account of the fact, however, that by far the greater part of the sulphide had been destroyed, it was evident that it would be useless to attempt the estimation of the amount of acetic acid produced. It would seem, therefore, impracticable to oxidize ethyl sulphide in this way with the intention of securing a large output of acetic acid, but any one can convince himself by an off-hand experiment that acetic acid is one of the products of the oxidation of diethyl sulphide under the above circumstances. This is another point of agreement between the sulphide from dog's urine and ethyl sulphide.

What light this oxidation throws on the nature of the union existing between ethyl sulphide and concentrated sulphuric acid, and also whether thio-acetic acid may not be an intermediate product in the oxidation with permanganate, I cannot here discuss.

DOUBLE COMPOUND WITH MERCURIC CHLORIDE.

As the new sulphur compound from the dog's urine has so many points in common with ethyl sulphide, its behavior towards mercuric chloride was next examined.

Some of the concentrated sulphuric acid solution of the sulphide from the dog's urine was placed in an ice mixture and diluted with a cold 4 per cent. solution of sulphuric acid until the resultant liquid was equal in strength to about a 30 per cent. sulphuric acid solution. The odor found to arise from such large amounts of the diluted fluid was very strong, and not to be distinguished from the odor of ethyl sulphide dissolved in concentrated sulphuric acid and treated in the same way. Indeed, none of the workers in my laboratory could tell in any given case whether I was using the compound obtained from dog's urine or that synthetically prepared. The diluted solution of the sulphide was now shaken out with ether and the separated ether was washed twice with distilled water; an alcoholic solution containing 1 gram of mercuric chloride was then added to the ether and the whole evaporated to about one-third on the water-bath, after which it was allowed to stand in vacuo over sulphuric acid. The residue, which smelled strongly of the sulphide, was well washed on a filter with water in order to dissolve away the excess of mercuric chloride. It was then dried on the filter over sulphuric acid, dissolved when dry in a little alcohol and allowed to crystallize. Some of the crystals, long, slender prisms mixed with some amorphous material were collected and their melting-point taken without further purification. This was found to be in one case about 145° C., and in another batch of crystals prepared in a very similar manner, 150° C. The noteworthy fact in both determinations was that the crystals melted to a black fluid, and after the capillary tubes had cooled, long slender prisms could be seen to stand out from the congealed drop.

I am personally convinced that this sulphide from the urine of the dog forms a double compound with mercuric chloride, although it must be admitted that the evidence, so far as its

melting-point is concerned, does not furnish conclusive proof that this compound is $(C_2H_5)_2.S.HgCl_2$.

In support of this opinion that a double compound is formed, we may urge the odor of the compound, its insolubility in water, its solubility in alcohol, its behavior in the melting tube and its crystalline character. After standing over sulphuric acid in vacuo, no odor, or at least only a very faint odor, is perceptible; but exposed to the air for only a few moments, the odor of the sulphide becomes very marked. The mercuric chloride compound of ethyl sulphide behaves in the same manner.

It is exceedingly difficult to separate a small amount of this unstable double compound, say a few centigrams, from an excess of mercuric chloride: the various operations, such as the long and repeated washings with water, the necessary drying, etc., all involve so much loss of substance that sharp results cannot be obtained when there is only little material on hand.

MELTING-POINT OF THE DOUBLE COMPOUND, $(C_2H_5)_2S.HgCl_2$.

The plan that was followed above in the attempt to secure and purify the double compound of ethyl sulphide from the dog's urine was based on previous experiments made in the same way with synthetically prepared ethyl sulphide. Five grams (boiling-point 91.9° C.) were dissolved in 50 cc. of concentrated sulphuric acid, and by following out the method described above, except that less of the theoretically required amount of mercuric chloride was used, the double compound crystallizing out of absolute alcohol in long, transparent, highly refracting prisms was obtained. This, recrystallized out of alcohol, washed with cold absolute alcohol and ether, and dried in vacuo over sulphuric acid and paraffine, began to melt at 118° C. and melted to a colorless fluid at 119° C. Subsequent recrystallizations out of ether caused no change in the melting-point. When the double compound is prepared by mixing alcoholic solutions of the sulphides and of mercuric chloride the melting-point is also 119°.

When some of the finely powdered crystals that show a melting-point of 119° are allowed to stand over sulphuric acid for two weeks, the melting-point is found to have risen to 131° C. Some of the unbroken crystals, however, that had stood for the same length of time over sulphuric acid melted at 120° C. When the temperature reached 180°–185° C. a rapid evolution of gas bubbles took place, but the liquid remained transparent and did not blacken.

Now Loir[1] gives 90° C. as the melting-point of $(C_2H_5)_2.S.HgCl_2$ crystallised out of ether. An observation made in the course of the above experiments may perhaps explain how Loir came to put the melting-point at 90° C. I prepared some of the ethyl sulphide mercuric chloride, recrystallised it out of absolute alcohol, washed it with absolute alcohol and ether, and exposed it for half an hour or so all the time attached to a Bunsen suction pump. At the expiration of this time the melting-point was determined. It was found that the substance melted at 80° C., yielding a perfectly transparent colorless

Ann. d. Chem. u. Pharm 87. p 376.

liquid. After standing for twelve hours over sulphuric acid *in vacuo* the melting-point was found to have risen to 119° C.

It may be remarked in passing that Blomstrand[1] finds one of Loir's melting-points, that of the platinum compound $2(C_2H_5)_2S.PtCl_4$, 70° too low, it being in reality 178° instead of 108° as given by Loir.

BEHAVIOR OF THE SULPHIDE TOWARD SOLUTIONS OF BROMINE AND IODINE.

It must be remembered that we are confined to solutions of the urinary sulphide in concentrated sulphuric acid for a study of its properties. The behavior of bromine and iodine toward these solutions is characteristic and in every respect like their behavior toward similar solutions of synthetically prepared ethyl sulphide. If a drop or two of a 2 per cent. solution of bromine in potassium bromide be added to a sulphuric acid solution of the urinary sulphide, or to an equally weak solution of ethyl sulphide, it will be observed that bromine is absorbed. The same thing is observed when bromine vapor is allowed to fall into a sulphuric acid solution that has previously been diluted with a few drops of water. If the sulphuric acid be poured off from the undissolved drop of bromine after having been thoroughly agitated with it, and then be diluted with water, it will be found that the sulphide odor no longer returns. If a piece of pure washed zinc and a little more concentrated sulphuric acid be added, the sulphide odor returns as the reduction proceeds. A solution of ethyl sulphide of about the same strength as that from the dog's urine behaves in the same way. But if a strong solution be made, the absorption of bromine is very evident, for now considerable bromine may be added before some of it remains undissolved. Such a concentrated solution of ethyl sulphide treated with bromine still smells somewhat of the sulphide after dilution with water, but if left to stand for a few days the odor disappears, and may then be caused to reappear on reduction with zinc and sulphuric acid. We are in all probability dealing here with the bromine addition compound $(C_2H_5)_2SBr_2$, which, as described by Rathke,[2] forms with water a colorless solution. Out of its aqueous solutions, iodine in potassium iodide precipitates an iodine addition product, $(C_2H_5)_2SI_2$, as a dark oily fluid.

Far more striking is the behavior of iodine, the study of which has led to a reaction which may under certain circumstances serve to indicate the presence of an alkyl sulphide. On the addition of a few drops of a 6–10 per cent. solution of iodine in potassium iodide, or of a $\frac{N}{20}$ normal iodine solution, an immediate precipitation occurs. The sulphuric acid solution becomes a dark brown, turbid fluid in which a precipitate of infinite fineness is suspended. After standing over night a small quantity of a dark brown oil separates out in minute droplets and settles to the bottom. This is undoubtedly the addition product $(C_2H_5)_2SI_2$.[3]

If the acid be poured off and water be added to this oily substance, the odor of a sulphide becomes at once apparent. The addition of a few drops of potassium hydrate immediately

causes the oil droplets to dissolve, and brings out the sulphide odor in full strength. Iodine solutions also cause the dark cloudy precipitations in sulphuric acid solutions of the sulphides even when these are very much diluted with water, so that this reaction must be regarded as a very sensitive one.

Furthermore, a drop or two of the sulphide shaken up with much distilled water, say 60 cc., also gives a cloudy precipitate on the addition of a $\frac{N}{20}$-normal iodine solution, and this precipitation occurs even when the aqueous solution has been allowed to stand for weeks, when we may be sure that the ethyl sulphide is really dissolved and not merely suspended. Out of these aqueous solutions of the sulphide to which iodine solutions have been added, the oily product referred to also settles on standing. This last reaction demonstrates very clearly that ethyl sulphide, contrary to the usual statements, is by no means insoluble in water. I daresay that its solubility in water is fully equal to that of ethyl mercaptan.

Methyl sulphide and methyl ethyl sulphide behave in almost the same way toward solutions of iodine. The oily compound that is precipitated from dilute solutions of methyl sulphide in sulphuric acid seems, however, to pass again into solution on standing.

If to a distillate of dog's urine that has been shaken with milk of lime or made strongly alkaline with a free alkali, a few drops of an $\frac{N}{20}$-iodine solution be added, a cloudy precipitation, very like that seen under the same circumstances in aqueous solutions of ethyl sulphide, will be observed. In this instance, however, the reaction is of uncertain meaning, for Schiff[1] has shown that the distillate of the dog's urine contains a primary amine, and Abbott[2] has found that aqueous solutions of amines give cloudy precipitates on addition of $\frac{N}{20}$-iodine solution.

BEHAVIOR OF ETHYL SULPHIDE TOWARDS NITROUS ACID.

While trying to establish the identity of the sulphide treated of in this paper, I observed that when a drop of an aqueous 5 per cent. solution of sodium nitrite was added to some of the sulphuric acid solution of the sulphide from the dog's urine, the latter at once took on a beautiful deep green color. A drop or two of Liebermann's[2] nitrose sulphuric acid solution gives the same color and is preferable as a reagent to an aqueous solution of a nitrite, as if used in excess it does not so readily cause the disappearance of the green color. The color persists for some time, but disappears if the solution is left to stand over night, and when the nitrite is not added in excess the reaction will be found to be of great delicacy.

To get this reaction with the urinary sulphide in perfection it is best to conduct the well-dried air and sulphide as

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[1] Jour. f. pract. Chem. (n. f.), Vol. 24, p. 190.
[2] Ann. d. Chem. u. Pharmac., Bd. 152, p. 214.
[3] Rathke, *loc. cit.*

[1] Zeitschr. f. physiol. Chemie, Bd. IV, p. 54.
[2] Private communication from Dr. A. C. Abbott, of the hygienic laboratory of the University of Pennsylvania, on the detection of amines in sewer air with N/20-iodine solution, which induced me to study the behavior of aqueous solutions of ethyl sulphide toward iodine solutions.
[2] Ber. d. deutsch. chem. Gesellsch., Bd. 20, p. 3231 b. In making up the solution of a nitrite in conc. sulph. acid I used sodium instead of potassium nitrite.

described on p. 125, with at least 5 or 6 liters of urine in the circuit, through a few cc. of concentrated sulphuric acid in a test tube an entire day. Special attention must be given to the drying of the air laden with the sulphide, for it is only when a completely dry current is passed into the concentrated sulphuric acid for the length of time named that a solution is obtained which will give at once the deep green color referred to, although solutions that have not remained so long in the circuit will also give a tinge of green, in which case, however, only a mere trace of the nitrite, such as adheres to a glass rod dipped into a solution of it, should be added. Now a drop or two of pure ethyl sulphide dissolved in a few cc. of concentrated sulphuric acid gives identically the same reaction on the addition of a drop or two of a nitrite solution or of nitrose sulphuric acid.

WHAT CHEMICAL CHANGES OCCUR IN THIS REACTION ?

As long as the color persists, the sulphide can be liberated by the addition of small pieces of ice or by dilution with water, but after standing over night exposed to the action of an excess of the nitrose sulphuric acid, the now colorless solution no longer throws out the sulphide on the addition of ice. The reason for this is that the sulphide has been slowly oxidized by the nitrous acid to a sulphoxide, while the latter is reduced to nitric or nitrous oxide. That this oxidation has occurred is demonstrated by adding a few pieces of zinc and allowing the reduction to continue for some hours and then diluting with crushed ice, when the original sulphide will again make its appearance. No further demonstration is needed to prove that the sulphide has been oxidized to a sulphoxide in the above experiment. Since methyl sulphide and methyl ethyl sulphide also behave in the same way toward nitrose sulphuric acid, it is fair to conclude that the reaction holds for the series of sulphides of the general formula $(C_nH_{2n+1})_2S$.

It might be suspected that the color reaction just described is due to thiophene formed on dissolving the sulphide in concentrated sulphuric acid, in analogy with the pyrogenous synthesis of thiophene first demonstrated by Kekulé.[1] That we are not dealing with thiophene is, however, shown by the absence of that characteristic play of colors (green, blue to purple) that is always observed when a little nitrose sulphuric acid is added to a freshly prepared sulphuric acid solution of thiophene, and by the fact that a solution of thiophene in concentrated sulphuric acid soon fails to give Liebermann's reaction, in consequence of the rapid conversion of the thiophene into thiophene sulphonic acid. Then, too, that the green color described does not owe its origin to thiophene is proved by the fact that solutions of ethyl sulphide in concentrated sulphuric acid do not give the indophenine reaction, a reaction quite as delicate as Liebermann's reaction for thiophene.

The mercaptans, too, do not appear to give this reaction. As is well known, these sulphur compounds, when dissolved in concentrated sulphuric acid, are changed to the corresponding disulphides. Sulphuric acid solutions of ethyl mercaptan, the only one of the mercaptans that I have thus far

prepared for comparison, become murky and take on a reddish yellow color on the addition of a few drops of Liebermann's solution. The sulphides of the series $C_nH_{2n}S$ also fail to give this reaction.[1] Ethylene sulphide and propylene sulphide, when dissolved in concentrated sulphuric acid in small amounts, yield slightly green solutions. On the addition of a few drops of nitrose sulphuric acid the green color instantly disappears, giving place in the propylene solution to a yellowish turbidity, while the ethylene solution remains colorless. Methylene sulphide gives a colorless solution with concentrated sulphuric acid, which undergoes no change on the addition of the nitrose sulphuric acid.

It may be mentioned in conclusion that the vapor of pure ethyl sulphide was subjected to a destructive oxidation by passing it mixed with moist oxygen over asbestos heated to redness, exactly as described in the combustion experiment with the urinary sulphide in the early part of this paper. Here, too, the air that escaped from the combustion tube was laden with acid vapors, and an examination of the weak sodium hydrate solution in the Geissler bulb showed that sulphuric acid was present. When the supply of oxygen was insufficient, the bulb also contained sulphurous acid.

HAS THE SULPHIDE AN INTESTINAL ORIGIN ?

The fact that methyl mercaptan is found among the gases of the large intestine,[2] and that there exists between ethyl mercaptan and ethyl sulphide a close relationship, suggests for the latter a possible intestinal origin, and that after absorption it unites with a compound that prevents its oxidation to end products and allows of its excretion in the urine. But an experiment in intestinal antisepsis[3] with calomel performed on a large well-nourished dog, showed after six days of abstention from all food except water and the administration of a total of 8 grams of calomel during the last three days, no appreciable diminution of the amount of the sulphide yielded to concentrated sulphuric acid. While this result is not absolutely conclusive because of the lack of quantitative methods for estimating the sulphide, and also because we cannot be certain that the bacterial activity in the intestines was completely suppressed, yet the evidence, so far as it goes, is against the bacterial origin of the sulphide. More conclusive is the negative outcome of all attempts to find the sulphide in the faeces of the dog by the use of the methods successfully applied to the urine.

The negative outcome of both experiments at least points to the probability that ethyl sulphide is a product of retrogressive metabolism. The urine, too, appears to contain decidedly more of the compound when the dogs are put on an exclusively meat diet than when fed on the mixed diet of refuse from the hospital kitchens.

So far as I have been able to discover, the kidney is the only other natural source besides the dog's urine, of the

[1] See V. Meyer : Ber. d. deutsch. chem. Gesell., Bd. 18, p. 217 a.

[1] This point was not established in the original German version of this paper.
[2] L. v. Nencki: Arch. f. exp. Path. u. Pharm.
Abth. 98, 137—48.
[3] Baumann: Zeitschr. f. physiol. Chem.

saturated alkyl sulphides. Now that we have methods for their detection, it is not unlikely that they will be found to be as widely distributed as are the mercaptans. I hope soon to be able to offer something definite as to the properties of the compound from which the sulphide is liberated in the dog's urine on treatment with alkalis, and also to be able to isolate the pure sulphide in sufficient amount for the determination of its boiling-point, etc. It is only after having accomplished the isolation of the compound with which the sulphide is united that we can say anything definite as to amounts in which the sulphide is excreted. Since, however, easily demonstrable quantities of sulphuric anhydride can be obtained by oxidizing its vapor, one is justified in the opinion that it is present in equal or greater quantity than are such compounds as sulphocyanic or thiosulphuric acid. And it seems fair to conclude that it will be found on quantitative estimation to answer to the still unidentified sulphur compounds in the dog's urine.

<div align="center">RÉSUMÉ.</div>

It will be seen that the difficulties encountered in the collection and study of the new compound were not few. The following points have, however, been clearly established:

1. When dog's urine is treated with alkalies, an odoriferous compound is liberated which contains sulphur and which is taken up with avidity by concentrated sulphuric acid and from which it is again liberated on dilution with water or on neutralization. The odor arising during the progress of the dilution or neutralization is not to be distinguished from that of ethyl sulphide, $(C_2H_5)_2S$. Ethyl sulphide is likewise absorbed by concentrated sulphuric acid with great avidity.

2. Oxidation of the urinary compound in the form of its solution in concentrated sulphuric acid yields sulphuric and acetic acids, thus demonstrating the presence in it of an ethyl group. Oxidation of ethyl sulphide under the same conditions yields the same products.

3. Mercuric chloride forms with the urinary sulphide a double compound which behaves, as far as could be determined, in regard to odor, solubility and crystallization, like the corresponding ethyl sulphide mercuric chloride, $(C_2H_5)_2S.HgCl_2$.

4. Bromine and iodine behave toward its solutions in concentrated sulphuric acid in every way as toward similar solutions of ethyl sulphide.

5. A nitrite added to its solutions in concentrated sulphuric acid gives the same intense green color as with solutions of ethyl sulphide.

6. The organic sulphide thus shown to exist in dog's urine is ethyl sulphide, $(C_2H_5)_2S$. The mixed sulphide, methyl ethyl sulphide $(CH_3.C_2H_5)S$, might be thought to have an equal claim with ethyl sulphide as a urinary constituent, since its solutions in concentrated sulphuric acid behave in the same way toward bromine, iodine and nitrous acid, and since the products of its oxidation by the method described are the same, but pure methyl ethyl sulphide that has been several times rectified is easily distinguishable from ethyl sulphide by its odor, which has an additional smell like that of rotten cabbages, not possessed by the latter.[1]

<div align="center">PURELY CHEMICAL RESULTS.</div>

The points of more especial chemical interest are:

1. The oxidation of ethyl sulphide to acetic and sulphuric acids.

2. Its great solubility in concentrated sulphuric acid, and the ease with which it can again be liberated from this solution even when dissolved in minute quantities.

3. Its oxidation to a sulphoxide by nitrous acid and its green color reaction with this reagent.

4. Its solubility in water and the ease with which its aqueous solutions can be detected with solutions of iodine in potassium iodide.

5. Also to be noted is the fact that the melting-point of ethyl sulphide mercuric chloride lies at 119° C., and not at 90° C. as stated by Loir and since his time in all reference books on chemistry.

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[1] See J. Finckh (Ber. d. deutsch. chem. Gesellsch., 1894, No. 9, p. 1239), who finds that these organic sulphides lose their nauseating odor on being repeatedly heated to 290°–300° C. in a sealed tube with powdered copper.

A CASE OF PARANOIA, WITH A STUDY OF THE CEREBRAL CONVOLUTIONS.

By Henry J. Berkley, M. D., *Clinical Lecturer in Psychiatry.*

Since the pathology of the mental disease known as primary paranoia is entirely unknown, the macroscopic examination of the brain in this case may not be devoid of clinical interest. The reader's attention is particularly called in the right hemisphere to the region of the post-central furrow, the very broken arrangement of the gyri of the parietal region, the unusual development of the third frontal convolution, short, broad, and standing isolated from the other convolutions of the lobe except on its orbital aspect. The external aspect of the left hemisphere is much more in conformity to recognized types, but the inner surface has many points of dissimilarity with the opposite brain-half. Altogether the impression given by both hemispheres is considerably at variance with the usual types of convolutional development, and the asymmetry between the hemispheres is very marked.

The early history of the patient, Sarah Janet N——n, is to a large extent shrouded in obscurity. Born in Scotland of respectable parents, she was given a fairly good education, and though moderately intelligent, she preferred wandering in the fields with the sheep and heather, to attending school. She stated that she was always on good terms with her school companions, but at home was restless, all her affections centering in a sister, to the exclusion of the rest of the household. The parents, as well as the brothers and sisters, are

represented as being healthy, mentally and physically. She also stated that she was married at an early age, and had two children by this husband and another by a lover.

About the age of thirty-five years she emigrated to this country and obtained employment as a housekeeper. She seems to have been fairly successful in giving satisfaction to her employers, though there were several changes during the five years previous to her admission to the City Asylum, and she was discharged from her last situation by reason of her quarrelsome disposition.

In 1890, when she was in her thirty-ninth year, the climacteric began, and by the commencement of July, 1891, all evidence of menstruation had ceased. There were during the menopause hemorrhages of some intensity from the uterus, for which she was treated at one of the city hospitals, where she resided several months and until she was obliged to leave. Finally she was sent to the City Almshouse (admitted August 6, 1889), where it was soon recognized that she was insane, being irritable, suspicious, and having marked delusions of persecution, the principal ones being that for a person of her position she was not treated with sufficient respect by the officers of the institution, and that her food was poisoned.

These delusions led to a number of outbreaks of violence against the inmates of the almshouse, and proceeded to the extent of an attack upon the superintendent, and on July 27, 1892, she was transferred to the City Insane Asylum.

At the time of her admission N. was extremely suspicious, and it took the physicians in attendance some time to gain her confidence, and then only by a complete acquiescence with her delusions, the slightest correction annihilating any one in her esteem, and afterwards it was impossible to make her hold any communication.

The patient was a tall, angular woman, without any marked signs of somatic degeneration. The skull was sub-brachycephalic, without irregularity in the cranial bones. Physical examination showed the viscera to be healthy with the exception of the lungs, these showing the signs of a beginning tuberculosis at the apices. The heart's action was steady, regular, and without abnormal murmur. There was no history of a traumatism, alcoholism, or of a previous attack of any of the infectious diseases, to supply an etiological factor for the development of the mental trouble.

After the few days necessary to overcome the suspicions she entertained in respect to the medical staff of the hospital, she unburdened herself fully of her troubles and insistent ideas. Delusions of persecution were strongly marked, but by no means paramount. On account of her *mission* she was molested and persecuted by a multitude of *enemies*, and though she made a strong effort to preserve outward calmness, occasionally she burst into a torrent of invective upon the heads of her enemies, magnifying the smallest offense against herself into mountains of malice and wickedness.

The delusions of persecution were, however, of small interest in comparison with other fixed ideas, and by contrast sank into the background. N. believed that she was a prophetess called of God, and was the "woman clothed with the sun, and the moon under her feet, and upon her head a crown of twelve stars," of the XII chap. of the book of the Revelation, and

that her present abode represented the allegorical wilderness where she was to be fed for a space of one thousand three hundred and threescore days, the time representing that of her earthly tribulations, at the end of which period there was to be the judgment day, and without dying she was to be translated to the presence of God. Not only was she to be translated undying, but in some way now unknown to her, and only to be revealed on that great and awful day, she was to take a chief part in the redemption of the human race and intercede between them and the Almighty. At the end of the day of judgment she was to ascend to her prepared abode in the heavenly Jerusalem amidst the rejoicings of the multitude and the "voice of mighty thunderings, saying Alleluia, for the Lord God omnipotent reigneth. Let us be glad and rejoice and give honor to him, for the marriage of the Lamb is come, and his wife has made herself ready" (Rev. xix).

The child spoken of in the first quoted chapter played a very secondary part in her delusion ; she considered the passage to refer to the last of her two male children and the subject played no further part in her history.

The mission on earth was to be a secret one, and while not hesitating to inform those in the immediate circle of her confidence of its purport, she chose not to herald it to the world, preferring to bide the proper time for the revelation.

N. had in her possession a small, well-thumbed Bible, which she carried with her even at meal-times, and constantly referred to ; in truth, the principal part of her time was spent in delving over its pages, searching for references to herself. Each one when found she marked with a round lead-pencil mark of a definite size. Not only were the passages referring to her marked, but a large number of scattered verses of different import were equally distinguished by a mark, having special reference to some idea or thought.

A few typical passages referring to her may be selected, as (Judges xiii) "Behold thou shalt conceive and bear a son, and now drink no wine nor strong drink, neither eat any unclean thing," a mandate she faithfully endeavored to carry out ; or, (I Kings iii) "I have given thee a wise and understanding heart, so that there was none like before thee, neither after thee shall any arise like unto thee," or, "For thy Maker is thine husband, the Lord of hosts is his name, and thy Redeemer the Holy one of Israel, the Lord of the whole earth shall he be called."

The other passages marked in the Bible were exceedingly numerous. Commencing with a systematic indication in Judges, they increased greatly in Job and Psalms, gradually diminished in Isaiah and Jeremiah, still remained a small number in the latter books of the Old Testament. In the four Gospels they were comparatively infrequent, increased very slightly in the Acts and Epistles, except in Romans and Hebrews, where the marks were frequent, and then gradually diminished to Revelation, where only a few chapters were marked, these having especial reference to herself and the New Jerusalem. A rather pathetic notice of the loss of her personal liberty occurred in II Corinthians, where she had marked "where the spirit of the Lord is, there is liberty."

The other very numerous marked verses may be arrayed under six headings : 1. Every passage referring to women in

travail and labor; (2), all passages referring to the rebuilding of the Temple and descriptions of the New Jerusalem, which she appeared to confound; (3), numerous references to her troubles; (4), appeals for help; (5), occasional songs of rejoicing; and lastly, denunciatory passages, which were everywhere indicated and were the most numerous of all, for example, "Behold the day of the Lord cometh, cruel both with wrath and fierce anger to lay the land desolate, and He shall destroy the sinners thereof out of it" (Isaiah xiii).

A considerable number of months passed, N. still retaining her delusions perfectly fixed and systematized, without the addition of hallucinations either visual or aural. She refuted all assertions combating any of these ideas by references to various passages in the Bible, and by the argument that all things in that book are from the mouth of God and therefore beyond the possibility of dispute.

Toward the end of the year 1893 the pulmonary tuberculosis began to make rapid advances, persistent diarrhœas set in, accompanied by much abdominal pain that narcotics only partially relieved. Neuralgic pains in the intercostal nerves also added greatly to her sufferings. Nevertheless she clung persistently to life and waited patiently for the day of her translation, not believing in the least that death would result from disease. Albuminuria now shortly developed, and finally death occurred on February 3, 1894.

A summary of the autopsy shows little of interest. All the principal organs with the exception of the lungs were normal. The brain was slightly reduced in volume; the membranes were normal, the gray matter not reduced in thickness to any appreciable extent. The general texture of the cerebral substance was firm.

The Description of the Cerebrum after Hardening.

a. The Principal Fissures.

The Sylvian fissures conform to the usual arrangement, neither ascending limb penetrating upward more than is ordinarily seen.

The Rolandic sulci of neither side show any unusual variations, though the right reaches a little closer to the interhemispheric fissure than its companion sulcus.

Inter-parietal sulci.—In the right hemisphere the post-central furrow commences in the depths of the Sylvian fissure, and extends to within 3 mm. of the margin of the interhemispheric fissure. It is unbroken by secondary gyri throughout its entire length. The inter-parietal furrow commences 32 mm. above the edge of the Sylvian fissure, and is entirely separated from the post-central furrow by a tongue of cortical substance extending from the gyri of the superior parietal lobe to the inferior parietal lobe. After running obliquely upwards and backwards about 30 mm., the fissure is broken by a broad convolution connecting the upper parietal lobe with the region of the angular gyrus. Again commencing behind this gyrus, it immediately throws off a rectangular branch toward the median surface of the brain, the furrow being deeper and longer than is usual, and then following its usual course 20 mm. further, it breaks up into six deep but short radii, and ends, not penetrating downward into the occipital region after the usual fashion.

The companion sulcus of the opposite hemisphere commences at the margin of the Sylvian fissure, runs obliquely upwards, then horizontally, and descending, penetrates deeply into the occipital lobe. The post-central gyrus of this side offers no anomalies in conformation.

The occipito-parietal sulci of both sides are deep; the left extends 3 mm. further into the lateral surface of the brain than the right, and at its innermost point there is a considerable depression, out of which extend five short branchlets, all having their origin in the fissure. The left fissure extends into the fissure of the hippocampal gyrus, the right runs into the calcarine fissure.

The calcarine fissures and the furrow of the corpus callosum follow the usual type.

The formation of the convolutions presents considerable variations from what may be considered the usual development.

b. Comparison of the Convolutions.

The gyri of the orbital surfaces of the frontal lobes, the convolutions of the island of Reil, the cerebellum and medulla oblongata, present neither asymmetry nor departure from the usual type.

The Frontal Lobes.—Right Hemisphere.—The superior frontal is very narrow, only 14 mm. in average breadth; and at its posterior end is almost completely separated from the paracentral lobe by a deep upward extension from the sulcus præcentralis crossing through the lobe to the median aspect of the hemisphere. At its anterior end it is fused with the substance of the middle frontal gyrus. The surface is furrowed by a few transverse sulci of little depth. The superior frontal sulcus has nothing noteworthy.

Left Hemisphere.—The first frontal of this side is also narrow, averaging 13 mm. The posterior half of the convolution is split into two separate gyri by a horizontal extension forward of a branch of the præcentral sulcus. The upper limb of the convolution joins the convolutions of the præcentral region, the lower turns obliquely downwards and joins the base of the middle frontal. At its anterior end it is fused with the intricate convolutions of the tip of the lobe. The first frontal sulcus is free from bridging.

Middle Frontal, Left Hemisphere.—This convolution is single, though in its posterior half it is 43 mm. broad, and is conjoined with the anterior central gyrus by a deep-seated pli-de-passage. The gyrus has a large number of short horizontal and transverse sulci of short extent.

Middle Frontal, Right Hemisphere.—The convolution is much broken by short tertiary fissures, and averages 35 mm. in breadth. At its base a strong bridge is thrown across the præcentral sulcus, uniting it with the gyrus cent. ant. About midway of its anterior border, a gyrus 6 mm. in breadth crosses the inferior frontal sulcus to the inferior frontal convolution, and divides the sulcus into two unequal portions, the anterior being the longer. The posterior limb of the sulcus turns downward, penetrates completely through the third frontal, and ends far within the fissure of Sylvius.

The Inferior Frontal, Left Side.—This convolution is

diminutive in comparison with the extraordinarily thick though short fellow of the opposite hemisphere. It averages 11 mm. in breadth, and as already described, is united in its middle portion with the second frontal, and at its anterior extremity with the convolutions of the orbital aspect of the lobe, the inf. frontal sulcus extending far forwards, separating it completely from the convolutions of the second frontal in this region.

The Inferior Frontal, Right Side.—This convolution is of rounded oval form, averaging 32 mm. in width by 59 mm. in length. It is completely separated from all other convolutions of the lateral surface of the lobe; in its posterior portion by the præcentral sulcus, and in all other regions by the inferior frontal sulcus, which winds completely around it and descends to the orbital surface of the lobe. This sulcus is confluent at its posterior end with the præcentral furrow. The convolution is much more complicated than any other of the lobe, the tertiary gyri being numerous. The opercular regions present a uniform view in both lobes.

The sulci præcentrales present the usual bridging extending from the frontal convolutions to the gyrus præcentralis.

Right Præcentral Gyrus.—This gyrus averages 11 mm. in breadth, and is split at its base by a deep tertiary fissure extending from the depths of the Sylvian fissure obliquely upward, finally debouching into the præcentral furrow, thus separating off a portion of the convolution nearly 12 mm. in length. The superior third of the gyrus is slightly broader than the middle portion, and is cut off from the paracentral convolution by a deep transverse incision.

Left Paracentral Gyrus.—This convolution averages 10 mm. in breadth, and is completely broken in its middle third by an unusually deep transverse incision from the sulcus præcentralis penetrating into the Rolandic fissure just above the mentioned bridge from the middle frontal. This deep incision is the only furrow on the convolution, the remaining portions being smooth.

Right Postcentral Gyrus.—The convolution only averages 8 mm., otherwise there is nothing to note.

Left Postcentral Gyrus.—This fold is exceedingly uneven and rugged; in some portions it is 6 mm. wide, in others it is 15 mm.

Right Parietal Lobe.—Besides the unusual development of the gyri crossing the interparietal fissure, the upper lobe is much broken by small vertical sulci, some communicating with the interparietal sulci, others separate from it. In the upper lobe, the gyri supermarginales, while complicated, are not irregular. The angular gyrus is connected with the upper lobe by the above-mentioned inconstant gyrus, otherwise the usual appearance of the region is retained.

Left Parietal Lobe.—The upper parietal lobe is divided into four gyri running vertically from the margin of the interparietal furrow. The inferior lobe has no departure from the customary type.

The occipital convolutions on both sides conform to the ordinary arrangement. The intervening sulci are deep.

Right Temporal Region.—The superior convolutions are doubled in their posterior portions by tertiary sulci, and are correspondingly broad. The inferior convolution is narrow in its anterior half, but broadens out considerably where it is confluent with the third occipital gyrus. The fissures present nothing of importance. The occipito-parietal and hippocampal gyri also have no departure from the usual form.

The left temporal region is in conformity with the usual type.

Median Aspect of the Right Hemisphere.—The inner aspect of the superior frontal averages 20 mm., in breadth, and is much broken by shallow transverse fissures. Near the paracentral lobe a number of oblique fissures mingle with the transverse. The sulcus calloso-marginalis follows its customary course. The gyrus fornicatus is smooth, except where it merges into the præcuneus, and averages 10 mm. in width.

The præcuneus, cuneus, and the internal aspect of the occipital convolutions have no departure from the common types. The sulcus hippocampi is unbroken by bridges.

Median Aspect of the Left Hemisphere.—The internal portion of the superior frontal averages 13 mm. in breadth, and is deeply incised by a tertiary furrow at the point where it joins the paracentral lobule.

Passing toward the corpus callosum we immediately come upon a secondary furrow, which, beginning under the knee of the corpus callosum, extends without break to the middle of the inner aspect of the paracentral lobule, ending within the lobule in a forked branch. Beneath this fissure is a second convolution exactly paralleling the superior frontal, having a breadth of 10 mm. It begins in a thin fold confluent with the superior frontal at a point 10 mm. in front of the optic commissure, and extends from this point unbroken by any deep incision into the anterior portion of the paracentral lobule, joining it just in front of the sulcus paracentralis by a tongue 3 mm. wide. Beneath this convolution lies the proper sulcus calloso-marginalis, which begins by an incision reaching nearly to the floor of the brain and immediately in front of the optic commissure, and after following the course of the corpus callosum, giving off on the way the sulcus paracentralis, it ends in the usual place behind the sulcus centralis. This configuration of the region gives a very broken lobus paracentralis, of less size than ordinary.

The gyrus fornicatus parallels the corpus callosum, is narrow and smooth, and [illegible] manner.

There is nothing unusual to note in the configuration of the præcuneus, cuneus or lingual lobe, except that they are more broken into minor convolutions than in the corresponding regions of the opposite hemisphere.

ANGIO-SARCOMA OF THE OVARY.

By Thos. S. Cullen, M. B.

(Reported at the Johns Hopkins Medical Society, November 5, 1894.)

L. R. æt. 48. Admitted to the Johns Hopkins Hospital in the service of Dr. Kelly, July 3, 1894.

Upon entering, the patient complained of enlargement in the lower part of the abdomen, pain in the abdomen and also in the back.

Menstruation commenced at 14 years, has always been regular. She has been married over twenty years, has had two children, the youngest of which is 12 years of age. There is also a history of numerous miscarriages.

Family history unimportant.

History of present illness.—In January the menses became profuse and painful and have continued to be so. During May she first experienced severe grinding pain in the left ovarian region. This has continued and at times radiates down the thighs. Simultaneous with the first appearance of the pain a mass was noticed in the abdomen just above the pubes; this gradually increased in size.

On physical examination the lower zone of the abdomen is found distended. The superficial veins are congested, and palpation reveals a firm bilobate mass springing from the pelvis. This extends slightly higher on the left than on the right side.

The anterior lip of the cervix is flush with the vaginal wall; the os is very patulous, admitting the index finger, and on the left side of the cervical canal a soft mass can be felt. The uterus is enlarged and appears to be continuous with the mass on the left side.

July 7, 1894. Operation by Dr. Kelly. Patient in Trendelenburg position.

An incision 19 cm. long was made in the abdominal wall. On the left side the pelvis was found to be choked by a soft mass; this was slightly movable, and extending over it was the rectum, which had been displaced toward the right side.

Both the rectum and sigmoid flexure were attached to the tumor by their posterior surfaces. The left ovarian vessels were secured and enucleation commenced. In loosening the left side the tumor commenced to tear, and it was necessary to hurry the operation as much as possible on account of hemorrhage. The uterus was then amputated at the cervix and the cervical stump closed by five silk sutures. Nodules of the growth still remained in Douglas's cul-de-sac, on the left side where the tumor had been separated, and also between the cervical stump and the posterior wall of the bladder.

A large gauze drain was placed in the lower angle of the wound and the abdomen closed by silkworm-gut sutures which included all the abdominal coats. Duration of the operation 51 minutes.

On the following day the drain was removed and about 15 cc. of thick bloody fluid escaped. The discharge gradually assumed the character of pus, and was still present when the patient left the hospital. There was a slight rise of temperature for the first two weeks, 102.5° F. being the highest point reached. Patient discharged September 3, 1894.

Pathological report.—That portion of the uterus present is 10x12x9 cm. It is irregularly globular, bright red in color, and covered both anteriorly and posteriorly by a few delicate adhesions. The under cut surface is 5 cm. in diameter. The uterus is firm and non-yielding; its walls average 2.5 cm. in thickness, and scattered throughout them are numerous homogeneous fatty-like masses, varying from .5 to 1.5 cm. in diameter. One of these presents dark red patches which are apparently small blood-vessels. The posterior part of the fundus is occupied by a submucous nodule 8x7x5 cm. This is somewhat lobulated and resembles raw beef in color. Springing from the lower margin of the nodule and continuous with it is a finger-like mass 6x4x1.5 cm. This projects into the cavity, and its lower teat-like extremity protrudes from the cervix. The uterine cavity is 7 cm. long and approximately 2.5 cm. in diameter. The mucosa on the anterior surface is whitish yellow in color and 1 mm. in thickness.

Springing from the right side of the cavity is a polyp 1.5 cm. in diameter. The large submucous nodule which projects into the uterine cavity is not covered by mucosa, but presents a slightly worm-eaten appearance.

The right tube and ovary are of small size and apparently normal.

On the left side of the uterus is a mutilated kidney-shaped mass 16x10.5 cm., the convexity of which is directed away from the uterus, while the concave portion is adherent over an area 8x9 cm. During operation the tumor was partially divided into three lobulated masses. On separating these still further from one another, they are seen to be composed of fibres which run in parallel rows. These fibres are light red in color and resemble strands of muscle. *In the centre of each fibre and running parallel with it is a delicate blood-vessel.* Other portions of the tumor are pale, homogeneous and resemble brain tissue, but on further examination are found to be also composed of fibres. There is apparently no breaking down of the tissue. The left tube is 11 cm. long, 5 mm. in diameter. Its outer extremity is adherent to the tumor. The parovarian is intact. No trace of the ovary is to be made out.

Histological examination.—The left ovary is found intimately adherent to the tumor, there being no dividing line between the two. A portion of the ovary is recognized by several large corpora fibrosa and a corpus luteum. The tumor mass is composed of spindle cells cut longitudinally and transversely, these tending to arrange themselves around blood-vessels, which are very numerous.

The vessels have an inner lining of endothelium, surrounding which in some places is a delicate muscular coat, the outer portions of which appear to have undergone hyaline degeneration. Immediately surrounding the muscular coat are 8 to 10 layers of spindle-shaped cells running parallel to the vessel. Such is the condition present where the vascular fibres were seen.
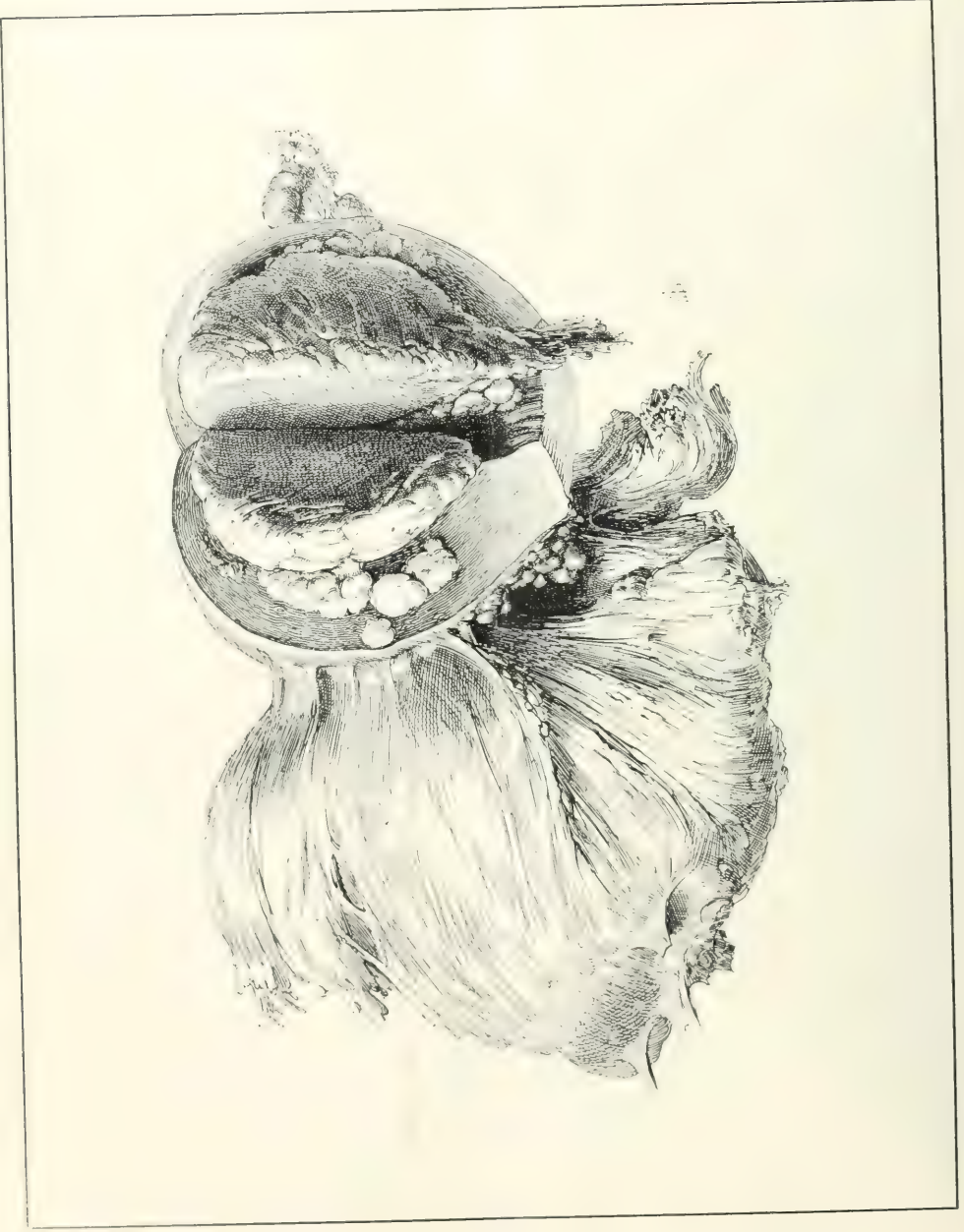
Angiosarcoma of Ovary.

In other portions of the tumor the blood-vessels are not so abundant, and the spindle cells do not maintain any definite arrangement. Many of the spindle cells have large oval nuclei, others show nuclear figures, while some apparently contain 2 to 3 deeply staining nuclei.

Here and there the tumor shows coagulation necrosis, sometimes with, sometimes without nuclear fragmentation, while in other places polynuclear leucocytes are present.

The Uterus.—The nodules scattered throughout the uterine wall are composed of cells precisely similar to those of the tumor. There is, however, no tendency toward the arrangement around blood-vessels. The large nodule projecting into the uterine cavity is similar in nature and presents numerous necrotic areas. On its free surface very little degeneration can be made out.

Uterine mucosa. The cervical glands are for the most part normal; a few, however, are dilated. The change from the cervical to the uterine mucosa is gradual, the latter being exceedingly thin. The surface epithelium is intact. The glands are scanty in number, cylindrical, and have an intact epithelial lining. Those glands in the depth of the mucosa run parallel to the surface. The stroma of uterine mucosa is of moderate density.

The left tube presents some hemorrhage in the muscular coat, and a few calcareous nodules are seen just beneath the peritoneum. The right tube and ovary also contain a few calcareous nodules.

Diagnosis.—Angio-sarcoma of left ovary. Extension into uterus by continuity and also apparently by metastases, the growth in the uterus being a spindle-celled sarcoma. Atrophy of uterine mucosa, calcareous nodules in both tubes and also in right ovary.

Round and spindle-celled sarcomata of the ovary, although not common, occur with a moderate degree of frequency, and we have been able to gather more than 70 cases from the literature.

Angio-sarcoma of this organ is, however, rare, and in most instances has been described under the title " Endothelioma."

Macroscopically the ovary may retain its normal contour, but be greatly enlarged; sometimes it is lobulated and may be either firm or soft. On section it is often found to contain cyst-like cavities. Some of the tumors appear to be composed of fibres with blood-vessels traversing the centre of each fibre. In these cases a diagnosis can immediately be made.

These tumors have two chief sources of origin: 1st, those arising from the blood-vessels (Amann (4 cases), Ackermann, Eckardt, Marchand); 2d, those springing from the lymphatics (Amann, Flaischlen, Leopold, Marchand, Pomorski, v. Rosthorn, v. Velits and Voigt). These two divisions are again subdivided according as the sarcoma arises from the outer sheath of the vessels or from their endothelial lining.

Our case was undoubtedly perithelial in origin, growing from the outer coats of the blood-vessels. As it is sometimes very difficult, and in fact impossible to say whether it arises from the outer or inner sheath of the vessels, we think the two

divisions are sufficient, viz., those arising from the blood-vessels and those springing from the lymphatics.

These tumors have occurred in children 7 years of age, and in women 64 years old. The average of 11 cases was 33 years.

The chief points in our case were the marked adherence of the tumor to the surrounding structures, the typical vascular fibres enabling us at once to diagnose it as angio-sarcoma, and the metastases in the uterus.

Dr. Welch. I have presented here an interesting specimen of an angio-sarcoma which is parallel to that of Dr. Cullen's. It is a most typical example of angio-sarcoma. A large tumor had grown in the axillary region, developing from the axillary lymphatic glands. It was operated upon by Dr. Keyes in New York. The operation was of unusual difficulty on account of the severe and almost uncontrollable hemorrhage. After the operation the tumor rapidly returned and there were metastases widely distributed in many organs of the body.

Dr. Cullen described his tumor as looking like a mass of muscle fibres. In my case it looked more like a mass of nerve fibres running parallel to each other, each fibre presenting a small central lumen. The tumor consists of blood-vessels running parallel with each other, and the tumor cells form the covering to the blood-vessels. There is an endothelial wall, then a few strands of circular muscle, then a little hyaline material, and then the tumor cells proper. The tissue between these strands is made up to a large extent of extravasation of blood, a few cells and a few strands of connective tissue.

Amann : Archiv f. Gyn., 1894, Bd. XLVI, S. 324.

Eckardt : Zeitschr. f. Geb. u. Gyn., 1889, XVI, S. 344.

Flaischlen : Zeitschr. f. Geb. u. Gyn., Bd. VII, S. 449.

Leopold : Archiv f. Gyn., 1873–74, Bd. VI, S. 202.

Marchand : Beiträge zur Kenntniss der Ovarien-Tumoren, Halle, 1879, S. 50.

Pomorski : Endothelioma Ovarii. Zeitschr. f. Geb. u. Gyn., 1890, XVIII, S. 92.

v. Rosthorn : Archiv f. Gyn., 1891, XLI, S. 328.

v. Velits : Zeitschr. f. Geb. u. Gyn., 1890, XVIII, S. 106.

Voigt : Zur Kenntniss des Endothelioma Ovarii. Archiv f. Gyn., 1894, XLVII, S. 560.

DESCRIPTION OF PLATE.

The specimen is viewed from behind, the uterus being cut open. On the left side a large mass of fibres, whitish and soft, was attached to the outer margin of this ovary and tube connection. The lower and inner portion of the tumor is composed almost exclusively of fibres running parallel to one another. The mass is intimately adherent to the left side of the uterus.

The uterus is at least three times its normal size, its walls being twice their usual thickness, while studding the uterine muscle are irregular whitish nodules. These nodules present a waxy appearance and stand out prominently. The uterine cavity is occupied by a large tumorous portion. The lower portion of the uterine cavity and a small part of the cervical canal are visible.

To the right of the uterus portions of the right tube and ovary can be distinguished.

PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS HOSPITAL MEDICAL SOCIETY.

Meeting of November 5, 1894.

Dr. Kelly in the Chair.

Exhibition of Specimens from a Case of Deciduoma Malignum.—Dr. J. Whitridge Williams.

Dr. J. Whitridge Williams exhibited the specimens from a case of deciduoma malignum.

The case presented the following history : R. W., aged 35 years, was a full-blooded negress, both her parents having been born in Africa. Family and past personal history have no bearing on the case. Has had five normal labors ; the third pregnancy terminated in a miscarriage at the sixth month.

During the last pregnancy she complained a good deal of headache, and the urine four days before labor contained a slight amount of albumen and a few hyaline casts, which, however, disappeared on the following day. She was delivered of a dead, full-term child about the 15th of April, 1894, after a normal labor with a vertex presentation. The labor lasted about 30 hours, and a good deal of blood was lost during the third stage, but there was no hemorrhage after the expulsion of the placenta. The puerperium was not entirely normal, the temperature remaining at about 100° and the patient being very much prostrated. Her physician saw her for eight days and then discontinued his visits, leaving her a tonic. About a week later the patient's mother informed him that there was a small and painful "waxen kernel" about the size of a pea on the right labium majus, for which he prescribed a soothing wash, without seeing the patient. Three weeks after the labor he was called once more to the case, and found the right labium swollen to about the size of a hen's egg and very painful. In it was a bright red tumor the size of a walnut, which rapidly increased in size and soon became gangrenous and ulcerated on the surface. So that a month after labor the tumor was the size of a hen's egg, markedly necrotic on its surface, and accompanied by hemorrhage and a very odorous discharge. It was not possible to say whether all the hemorrhage came from the vulva, or whether a part of it also came from the uterus. As the patient's condition was rapidly growing worse, the physician advised her to enter the Maryland General Hospital, where she died, July 12, 1894, three months after the birth of the child.

At the hospital it was said that she was suffering from septicæmia and that a large sloughing mass occupied nearly the whole of the right labium and the adjacent tissue. In the center of the mass was a fistulous opening into the rectum, through which fæces were discharged. The temperature varied from 99° in the morning to 103° in the evening, but during the last three weeks of life did not rise above 100°.

Death from exhaustion. The clinical diagnosis was "sloughing hæmatoma of the vulva."

The autopsy was performed by Dr. W. T. Howard, Jr., who kindly placed the case at my disposal.

At the autopsy, the entrance of the vulva was found to be surrounded by a large, irregular sloughing mass 10 cm. in diameter, which extended some distance up the vagina, where it had ulcerated through into the rectum, forming a recto-vaginal fistula.

The uterus itself was about twice the normal size, and from its posterior wall arose a mass 2½ by 1½ cm., which projected about 1 cm. into the uterine cavity. Its exterior was grayish and necrotic in appearance, but on section it presented a reddish-brown, spongy appearance, somewhat suggestive of placental tissue. There was also a small tumor of the same character in the fundus. In the vagina, between the cervix and the growth at the vulva, there was a round ulceration 1½ to 2 cm. in diameter.

The growth at the vulva, as is readily seen from the specimen, presented a very marked sloughy appearance.

The uterine tumors are very small and would hardly seem likely to give rise to any great trouble, but the occurrence of metastases in other organs demonstrated their malignant character.

Both lungs, especially in their peripheral portions, were filled with metastases which varied from a pea to an English walnut in size, and varied in color from grayish to grayish-red ; they all presented a sponge-like structure and were extremely suggestive of placental tissue. Smaller metastases of the same character were found in the liver and also in the kidneys. There was a large infarction in the spleen and several small metastases, and also one at the hilum of the right ovary, the size of a hazel-nut.

The interesting feature of the case is its very rapid course ; the uterine tumors apparently developing after the birth of the last child, and causing death from sepsis and the formation of metastases in less than three months.

This case belongs to the group of uterine tumors to which Sänger first directed attention and designated as "deciduoma malignum." Under the microscope, the primary uterine tumors, as well as the metastases, consist of a meshwork of tissue, with the meshes filled with blood, and the tissue itself composed of large, irregularly shaped cells with variously shaped nuclei which stain very deeply.

These cells at first sight closely resemble epithelial cells, but any one who is familiar with the structure of the uterus is immediately impressed with their similarity with the cells of the normal decidua, and closer study shows that they are identical with them, and that we have to deal with a hemorrhagic sarcoma arising from the decidua cells.

The first case of this variety was observed by Sänger in 1889, and last year he wrote an exhaustive monograph upon the subject. He showed that the cells composing it were identical with the decidua cells, and that the entire growth must be looked upon as a sarcoma arising from the decidua. The facts seem to bear him out, and any one who will take the trouble to examine the sections which we present of our tumor, and compare them with the sections of the normal decidua, will at once see a marked likeness.

Sänger at first proposed to call the growth "deciduoma malignum," but in his monograph he stated that the term had not been well chosen, and suggested instead the term "sarcoma deciduocellulare," so that its sarcomatous nature would be expressed by it.

Pfeiffer, a pupil of Chiari, observed a similar case about the same time, and likewise, without any knowledge of Sänger's publication, proposed the name "deciduoma malignum" for it.

Since that time a considerable number of cases have been reported, 13 in all. Our case makes the fourteenth, and is the first case to have been observed in America, and the only case observed in the negro race.

It is also of interest that nearly all the cases occurred in young women, for in 8 of the 13 cases already described the women were under 30 years of age, the majority being from 24 to 26 years old. This is a marked contrast to the carcinomata which usually appear about or after the menopause.

I exhibit the specimen and report the case in this brief manner merely to put it upon record, as it will be carefully worked out and published in detail at a later date.

The Best Method of Sharpening a Microtome Knife.—Dr. Lotsy.

During my stay at the Botanical Laboratory in Gröningen I had the good fortune of becoming acquainted with Dr. Moll's method of sharpening microtome knives. His method is superior to any other, in that it allows one to put the knife in good shape inside of a few minutes for any section he wants to cut. Before using this

method, any concavity of the knife blade must first be taken away. Dr. Moll uses a plate of polished glass which is fixed in a piece of wood, and two different powders, viz., Vienna chalk and diamantine. A paste is made of one of these powders and put upon the glass; then the knife is simply moved backwards and forwards upon the glass over the paste. By means of the Vienna chalk you can polish your knife in a very few minutes. The diamantine allows you to put a sharp edge on it, but does not give a polished surface, but rather a rough one. Now when you have a knife which is highly polished you can cut a section of, say, 5μ perfectly well, but if you try to cut with it a section of 1 to 2μ you will not succeed at all, your sections will become compressed and wrinkled and you can do nothing with them. On the other hand, if you try to cut a section of 5μ with a knife having a rough surface your section rolls up. This rolling up of a section has been represented to be a fault in the paraffine, but that is not the case; we must adapt the knife to every thickness of section we wish to cut. Starting out with a certain knife, if your section curls up, the proper thing to do is to polish your knife with Vienna chalk, and your section for that thickness will not curl up any more.

If your section becomes too much compressed, your knife should be rubbed over the diamantine and the polished surface taken away, when the sections will be cut without compression.*

Ureterotomy.—Dr. KELLY.

I wish to speak briefly concerning a novel operation which I have had occasion to employ within the last six months.

The importance of placing bougies in the ureters before beginning a difficult operation upon the pelvic organs in which the ureters may be involved has been dwelt upon by me before the society at previous meetings. While this is practicable in nearly all cases, it is not advisable where time is a large factor in the operation, as placing the patient in the knee-breast position and searching for the ureters, particularly if the operator is not an adept in ureteral catheterization, may consume much valuable time after the patient is under the anæsthetic. Under these circumstances it is best to proceed at once with the operation, observing the greatest care in placing sutures in the ureteral areas.

Within the last year I have performed three operations, at the completion of which I feared the ureter had been ligated, as it appeared in each instance to be enlarged.

It was impossible to ascertain certainly whether this accident had occurred without either taking out a large number of ligatures which had been placed in the ureteral area, or catheterizing the ureters. In either event the danger would have been much greater to the patient than the operation which I am about to describe. To remove all of the ligatures in the ureteral area and religate all of the bleeding vessels would have consumed too much time, and the catheterization of the ureters would have been still more impracticable.

For these reasons I determined to resort to ureterotomy as the easiest solution of my dilemma. Accordingly I located the ureter at the pelvic brim, snipped the peritoneum over its course, and made a longitudinal incision $\frac{1}{2}$ cm. in length into the lumen, through which I passed a small ureteral sound down into the bladder. In two cases, of the three, I found the ureters free, the enlargement being simply due to the pressure of the pelvic mass previous to the operation. In the third case, however, I found that the ureter had been included *en masse* with a large area of bleeding tissue in the pelvic floor. I at once removed the constricting ligature and was able to pass the sound into the bladder. By this simple operation much valuable time was saved, and

uninterrupted recoveries in each case justified the statement that the operation is without danger.

In closing the slit in the ureter I have used the delicate mattress sutures in two cases. The third required four sutures on account of the persistent oozing of urine. These sutures are very lightly passed into the outer coat of the ureter, not entering its lumen.

The cases in which I have resorted to this operation have been myoma uteri, carcinoma uteri, and dense pelvic inflammatory disease.

All of the patients have made complete recoveries and there have been no apparent ill effects from the operation up to this time.

I used gauze drainage in each case and there was not the slightest urinary odor detected at any time on the dressings.

While, as I have stated, I do not consider the operation a dangerous one, I do not advise it except in such instances as I have just spoken of. If there is grave doubt as to whether the ureter has been ligated or cut I earnestly advise this diagnostic measure, as I feel assured that a certain number of lives will be saved in this way.

A New Method of exploring the Rectum and Sigmoid Flexure.—Dr. KELLY.

What I wish to do this evening is not to speak of the principles involved, but to demonstrate my method of examining the lower bowel. I will be able to show you through the rectal speculum further inside the lower intestinal canal than has ever been exhibited before without the intervention of artificial light or mirrors or a glass diaphragm between the eye and the part to be inspected.

I have for quite a number of years, even while I was in Philadelphia, been in the habit of examining a dilated rectum with the patient in the knee-breast posture, and this is the main feature in a satisfactory examination. So many patients have come to me lately suffering with pelvic inflammatory troubles, pelvic abscesses, etc., associated with stricture of the rectum or with tenesmus and frequent passages containing large quantities of mucus, that I have found it necessary to examine these patients minutely in order to definitely localize the disease of the bowels. For this purpose I have devised instruments which enable me to examine at a glance the whole of the lower part of the rectum, and not only the lower part of the rectum, but also that portion which lies above the ampulla and the sigmoid flexure, beyond the promontory of the sacrum. With the largest speculum I am able to enter the descending colon, and I hope in time to inspect even the transverse colon.

The instruments employed are simple and few in number. Instead of a series of rectal dilators, I find a conical dilator best, varying in size from the point, 2 cm. in diameter, to the base, 6 cm., which is equivalent to a large series. This dilator must be well anointed with vaseline, and then by a boring movement one can dilate the rectum equably, without pain, and much better than is possible by simply pulling with the fingers from tuber ischium to tuber ischium. After using the dilator I take one of these cylindrical specula, made according to the same pattern as my bladder specula. Each speculum is accurately fitted with an obturator which facilitates its introduction and prevents any injury to the bowel. With the patient in the knee-breast posture I gently introduce the speculum, letting it take its own course as much as possible. Knowing the general course of the rectum, I am able to guide the instrument safely into its upper third and thence into the sigmoid flexure.

This is one of the shorter specula intended only for proctoscopy. The rectum is now well distended and you can see the minutest macroscopic lesion if there be one. Having inspected the rectum, I next introduce the long cylinder, and by guiding it over the promontory of the sacrum I at once open up the passage length of the sigmoid flexure for inspection.

This method of examination of the rectum opens up a very

interesting field, and also throws light upon certain diseases which before have been obscure.

A case which recently left Ward B aptly illustrates this statement. The patient had suffered for a number of years with intense pain in the lower bowel and diarrhœa. The stools contained mucus and were often bloody in character.

Upon inspecting the rectum and sigmoid I was surprised to find the disease a true proctitis, and that the sigmoid appeared to be perfectly healthly.

I at once instituted topical treatment of silver nitrate and ordered a rectal douche, and the patient made a most satisfactory recovery. Strictures of the lower bowel can be accurately located by this method.

In conclusion I will repeat that the success of this method of examination depends entirely upon the posture.

Double Castration for Hypertrophy of the Prostate Gland.
Dr. Finney.

There is really nothing to be seen in this patient, but I take the opportunity before he leaves the hospital of calling your attention to the case. In 1893, before the American Surgical Association, Dr. J. Wm. White, of Philadelphia, in a paper on "The Hypertrophy of the Prostate Gland," first suggested the advisability of double castration in obstinate cases. He had at that time not operated himself. His line of argument was briefly as follows: While the prostate and the uterus are not embryologically homologous, still they are very much alike histologically. Certainly, from work dating back to the time of John Hunter and others, the prostate has been shown to have definite sexual relations. It enlarges during sexual life. During the wane of sexual life certain definite changes take place in it which are closely allied to similar changes in the uterus. After a certain length of time, as in uterine myomata, the prostate undergoes certain degenerative changes. This suggested to him the possibility that castration might have an effect upon these growths similar to the effect of ovariotomy upon the uterine myomata. Some time elapsed before the first case was operated upon by Dr. Haynes, of Los Angeles, California. About the same time Ramm, of Christiania, had operated upon two cases entirely independently of Dr. White's suggestion. A review of his article appeared in the "Annals of Surgery" soon after the meeting of the American Surgical Association. A collection of all the cases that Dr. White could find recorded appeared in the Medical News in June last. He there reports nine cases, and since that time a number of others have been reported. In all favorable changes have been noted, and in some, almost an entire relief of the symptoms.

This patient entered the hospital in August '94, complaining of inability to urinate and constant dribbling of urine, dating back two years. He had to resort to the constant use of the catheter. At that time examination of the prostate showed it to be very much enlarged. The urine contained a trace of albumen, very few casts, slight amount of pus; was acid, and specific gravity 1.014. Upon catheterization 420 cc. of urine were drawn off. The capacity of the bladder was about 1000 cc. The bladder was much dilated and atonic. Examination for stone negative. The patient was put upon the regulation treatment, washing out the bladder, regular catheterization and the usual internal medication. Still he was unable to void his urine, so the operation of castration was proposed. He very willingly agreed to it and it was performed September 22, '94. On the sixth day following he urinated unassisted, and since that day, with one or two setbacks, he has done well. He has had occasional attacks of pain in the right side along the ureter and over the kidney, after which there appeared a little pus in the urine, but nothing more definite. The last note in his history five weeks after operation is as follows : "The lateral lobes of the prostate are just palpable to the right and left of the silver catheter previously introduced. They are soft, not tender, and show marked atrophy. There is now not more than 50 cc. of residual urine ; total amount 1200–1500 cc. He urinates about seven times in the 24 hours. In other respects he is in very good condition."

Very recently I have operated upon a second patient in private practice. Hi trouble was of five years' duration, with inability to urinate for two years past. The prostate was much enlarged : the urine contained pus and albumen in small amount. From frequent and rough sing of the catheter, a false passage had been made, and later ca eterization became very difficult and painful. For this reason the eration of castration was advised. He has urinated without difficulty since the fifth day.

NOTES ON NEW BOOKS.

A Manual of Modern Surgery, General and Operative. By John Chalmers Da Costa, M. D. (*Philadelphia : W. B. Saunders,* 1894.)

This book, of nearly 800 pages, is divided up into 37 sections, the first 16 of which are devoted to bacteriology, pathology and general diseases, the remainder to local affections. The chapter on bacteriology is short and shows some rather important mistakes and omissions.

The bacillus of actinomycosis is still classed with the fungi ; and this mistake again occurs in the chapter on actinomycosis. Amongst the organisms cited as pus-producers, the staphylococcus epidermidis albus, the common cause of stitch abscesses and suppuration along drainage tubes, is not mentioned. The gonococcus, which is usually described as a pus-forming organism, is placed under the heading "Other Surgical Microbes." Under this last heading are placed those organisms occurring in surgical diseases and not strictly pus-formers. The diplococcus lanceolatus, a frequent cause of empyema and of infections about the mouth, is not mentioned, nor is the typhoid bacillus, a not uncommon cause of bone disease and suppuration.

The class protozoa is not mentioned, though the amœba coli is a frequent cause of a strictly surgical disease, abscess of the liver.

The bacterium coli commune is merely mentioned as the supposed cause of peritonitis, though most authors regard it as the common cause of appendicitis and also of cystitis.

The pathological portion of the chapter on inflammation is a short resumé of the Cohnheim theory ; the clinical portion is very full and complete.

The chapter on tuberculosis and scrofula could be improved, we think, by leaving out scrofula ; the term scrofula is out of place in a text-book of modern surgery, scrofula being a relic of bygone days, and conveying to the mind the idea of a series of clinical symptoms without any definite pathological basis.

The statement that the leprosy bacillus is the only bacillus besides that of tubercle, in which the aniline stain is not removed by acids is incorrect, the common smegma bacillus resisting acids also, and being practically indistinguishable from the tubercle bacillus by ordinary methods of staining.

The chapter on syphilis is good ; the most modern treatment, however, is not to give either mercury or the iodides for lengthy periods of time, but to alternate the two.

The chapter on new growths is fairly complete ; a few of the rarer tumors, as the deciduomata, implantation and foreign body cysts, and malignant adenoma of the thyroid, are not mentioned.

The chapter on diseases of the bones and joints is perhaps the most satisfactory in the book, the portion devoted to fractures and dislocations being especially good. Plaster is not used as a rule in the early stages of fracture, and the ambulatory treatment of fractures is not spoken of.

The chapter on diseases and injuries of nerves is short and to the point ; the author has rather more faith in restoration of func-

tion after nerve suture, than the work of experimental physiologists would seem to justify.

In the chapter on the surgery of the respiratory organs no mention is made of the surgical treatment of pulmonary cavities, which, though undoubtedly limited, is o use in some picked cases of bronchiectasis.

In the chapter on diseases and injuries of the lymphatics, the treatment of chronic adenitis should not be confined to constitutional treatment in all cases; the knife should at least be mentioned.

Asepsis and antisepsis, the safeguards of modern operative surgery, are accorded 5 pages out of 785. Not nearly enough space is given to this subject, and a much more detailed account of technique, dressings, etc., should have been given.

Taking the operative section of the book as a whole, the great fault is the entirely too frequent use of the drainage tube.

The author's style is clear, but rather too didactic; in places errors are made in quoting, for instance we could imagine that Dr. Burdon Sanderson would object to being called Burden-Sanderson.

Edinburgh Hospital Reports, Vol. I, 1893, Vol. II, 1894. Edited by Drs. GIBSON, CATHCART, THOMPSON, and BERRY HART. (*Young J. Pentland, Edinburgh, Scotland.*)

These splendid volumes form a contribution worthy in every respect of the Edinburgh school. The introductory articles in Vol. I deal with the history of the Royal Infirmary, the Royal Hospital for Sick Children, and the Royal Maternity and Simpson Memorial Hospital.

A very fitting tribute is paid by Sir Grainger Stewart to the memory of Hughes Bennett, to whom, more than to any other man, the credit is due of establishing the Edinburgh method of bedside instruction.

In Vol. I the medical papers predominate; many of them consist of the reports of cases of special interest; others are more elaborate and consist of analyses of the collected hospital material. A unique instance of a tumor in the right ventricle acting as a ball-valve is reported by Professor Gairdner of Glasgow.

The surgical and special papers occupy scarcely a quarter of the volume, but contain a number of most interesting articles, among others, on three cases of the somewhat rare *kopftetanus* of Rose. As a supplement to the volume are the reports of the medical and surgical registrars.

Vol. II opens with a most interesting article by Professor Gairdner on the Royal Infirmary in the fifties. The personal notices of Begbie, Murchison, Sanders and others are particularly attractive. Dr. John Wyllie, in a paper on the diagnostic value of patterns of abdominal tumidity, calls attention to many points which are too often neglected, and there are few surgeons or physicians who could not derive valuable information from the cases which he there reports and from the excellent illustrations.

Dr. Leith's paper on actinomycosis, which is illustrated by five plates of exceptional beauty, not only gives an excellent anatomical account of the disease, but an analysis of recorded cases. The same writer contributes an exhaustive paper on acute perforating ulcer of the stomach. This lesion seems to be very frequent in Edinburgh, as it is stated by Dr. Gillespie, in Notes on the Medical Statistics, that during the year 87 cases were treated. There are several valuable contributions on diseases of the heart by Gibson, Muir, Thompson, and Mackenzie.

Sir Grainger Stewart records a most anomalous case of nervous disease with an extraordinary gait and misplacement of the sensory impressions.

We are glad to see the word appendicitis in one of the surgical papers, as indicating that, in North Britain at least, writers are beginning to abandon the old misleading terms of typhlitis and perityphlitis.

Among the surgical papers is a valuable one by Dr. Stiles on tuberculosis of the tunica vaginalis testis.

These volumes are unusually rich in important and practical contributions to medicine and surgery, and afford proof—if indeed that is needed—of the continued activity of the Edinburgh school.

The typography of the volume is, for hospital reports, exceptionally good, and the paper, type and plates are in Mr. Pentland's very best style.

I. IJIMA and T. KURIMOTO—On a new human Tape-worm (*Bothriocephalus* sp.); The Journ. of the College of Science, Imperial Univ., Japan, VI, 1894, pp. 371-385, Pl. XVIII.

R. BLANCHARD—Notices sur les Parasites de l'Homme: IV.—Sur le *Krabbea grandis*, et remarques sur la classification des Bothriocéphalines; Compt. rend. d. l. Soc. d. Biol., Paris. 1894. pp. 699-702.

Although we frequently find parasites which are additions to the fauna of the human body, it is now quite a rare occurrence to find a parasite in man which represents a new zoological species—much less a new genus. The two papers cited above are, therefore, deserving of more than a passing notice.

Ijima and Kurimoto have recently found a very large tape-worm in man which differs radically from any form ever recorded for the human species, but which agrees in certain important anatomical characters with some tape-worms reported in seals (*Phoca*).

The patient who harbored this parasite had lived for the greater part of his life on the seaboard. He was born in the province Hizen, and had never been in any other part of the country. After suffering for five years at irregular intervals with attacks of vertigo and colic, exhibiting also a progressive anæmia, he passed a fragment of a tape-worm. The attacks of colic returned and increased in violence. After a dose of anthelmintics he passed more of the parasite and the symptoms disappeared.

The head of the worm was not found, but from the general structure of the segments examined, it may be concluded that there are two (one dorsal and one ventral!) groove-suckers, agreeing approximately with the head of *Bothriocephalus latus*. The worm is estimated at about 10 metres in length; the broadest segments measuring 25 mm. in breadth when fresh, and 14-16 mm. when preserved in alcohol, and are remarkably short, the largest measuring only 0.45 mm. long. The general structure of the genitalia agrees with that of *B. latus*, but instead of there being only one set in each segment, two sets are found, one on each side of the median field; two longitudinal grooves are seen on the ventral surface of the worm, each groove containing in each segment the openings (penis, vagina, uterus) of one set of genital organs. The egg is oval, 63u by 48-50u, with a thick brown shell.

The presence of two sets of genital organs is the special character to be borne in mind in connection with this species. Blanchard, the Parisian medical zoologist, proposes to erect a new genus for tape-worms of the family *Bothriocephalidæ* which present this arrangement of the genitalia, naming the genus *Krabbea* (after the Danish helminthologist), and establishing the combination *K. grandis* for the species described by Ijima and Kurimoto. In this same genus he also places the species *Krabbea fasciata* (Krabbe) R. Bl. 1894. *K.* ████████ (Krabbe) R. Bl. 1894.

It is extremely interesting to note this parallel in the families ████████ ███ ████ ███ ████ with single genital pores (*B. latus* and all others of this genus, *Taenia solium*, *T.* ██████████), ██████████ ████ ████ ████ ████ those with double genital pores (the genus *Krabbea*, in the first family, and the genus ██████████ ████████ ████ ████ ██ family. In the scale ████ ████████ ████ ██████ in this country. ██ ████ ████████ ████ ████ ████████ double pores, while in Europe we find another species (*Th. Giardi* in sheep) which generally possesses single pores, but occasionally has double pores.

From Blanchard's article the following key may be compiled for the determination of species of the collective genus *Bothriocephalus*:

1 { Genital organs single 2
  { Genital organs double 4

2 { Genital openings lateral (marginal), *Bothriotænia* Railliet, 1892.
  { Genital openings ventral or dorsal. 3

3 { Penis, vulva and uterus open ventro-median,
  {   *Bothriocephalus* Bremser, 1819.
  { Penis and vulva ventro-median ; uterus opens dorso-median,
  {   *Ptychobothrium* Lönnberg, 1889.

4 { Penis, vulva and uterus open ventrally, *Krabbea* R. Bl., 1894.
  { Penis and vulva open ventrally ; uterus opens dorsally,
  {   *Diplogonoporus* Lönnb., 1892 (*Amphitretus* R. Bl., 1894).
                                                              STILES

WASHINGTON, D. C.

Text-book of Hygiene : a Comprehensive Treatise on the Principles and Practice of Preventive Medicine from an American Standpoint. By GEORGE H. ROHÉ, M. D. Third edition, thoroughly revised and largely rewritten, with many illustrations and valuable tables. (*Philadelphia : The F. A. Davis Co., Publishers*, 1894.)

A second edition of this excellent work was noticed in the BULLETIN for January, 1891. The fact that a third edition has been called indicates a growing popular interest in preventive medicine. The present edition has been enlarged by the addition of upwards of a hundred pages, and many of the chapters have been entirely rewritten. Useful additions to the chapters on Quarantine, Examination of Air, Food and Water, and Vital Statistics have been made by Surgeons Wyman and Geddings of the Marine Hospital Service, and Prof. Egbert of Philadelphia. A series of questions has also been appended to each chapter to facilitate the use of the book in the class-room. The book is a simple, unpretentious, practical manual especially adapted to the use of health officers and medical students.

A Dictionary of Medicine, including General Pathology, General Therapeutics, Hygiene, and the Diseases of Women and Children. By various Writers. Edited by RICHARD QUAIN, M. D., LL. D., F. R. S., assisted by FREDERICK T. ROBERTS, M. D., and J. MITCHELL BRUCE, M. D. With an American Appendix by S. T. ARMSTRONG, M. D., Ph. D. New Edition. Revised throughout and enlarged. 2 vols., pp. xxiv, 1261, and viii, 1305 ; 181 illustrations. (*New York : D. Appleton & Co.*, 1894.)

The original issue of this work in 1882 was a single volume of 1834 pages. · The present edition, reprinted in larger type, is in two volumes of upwards of 2600 pages, and has been revised and much new matter has been added. Most of the articles are systematically written and exhaustive, and the work can be recommended as a book of reference for students and practitioners. The merit of the different portions, as might naturally be expected from so many writers, varies materially, and there are some repetitions and inconsistencies in the various articles. It is clearly and attractively printed and the illustrations are good.

A careful reading of the articles discloses some important omissions. Thus under the head of dysentery no reference is made to the excellent and exhaustive work of Councilman and Lafleur which has contributed so much to the pathology of amœbic dysentery. The treatment laid down for appendicitis is not in accordance with modern ideas, and while surgical interference is mentioned as recommended by some, its importance is not emphasized. Sir William Gull's obsolete term, arterio-capillary fibrosis, is employed and carefully explained, but the more modern one, arterio-sclerosis, is not mentioned. There is no article on blood examination, and even in the article on leucocythaemia no reference is made to the important aid derived from the Ehrlich methods of blood examination. In the operative treatment of carcinoma of the breast, excision of the glands in the axilla is recommended, but nothing is said of the much more important procedure of removing the pectoral muscle. In the article on insanity no mention is made of paranoia, although a misleading and inadequate definition is given in the Appendix to the effect that English alienists use the term " delusional insanity " in its place. The term "*primary* delusional insanity," which is quite a different matter, was once used by English and American alienists, but the term paranoia has been adopted instead as shorter and equally satisfactory. In describing the micro-organisms of malarial fever, the causative relation of the *plasmodium malariæ* is not stated as definitely and positively as we are justified in doing in the light of our present knowledge. The chapter on diseases of the womb is inadequate and fails to give a just conception of the modern nomenclature, pathology or treatment of these disorders. The American Appendix savors more of the character of a medical dictionary than of a dictionary of medicine. It is a medley of short definitions of rarely used medical terms, and of slip-shod descriptions of diseases and names of American mineral springs—the mineral springs predominating—and adds little to the value of the work.

Text-book of Anatomy and Physiology for Nurses : Compiled by DIANA CLIFFORD KIMBER, Assistant Superintendent, New York City Training School, Blackwell's Island, N. Y. (*New York and London, Macmillan & Co.*, 1894.)

It is always a difficult task to determine how much theoretical knowledge ought to be included in a text-book intended for the sole instruction of nurses. Some manuals for nurses err upon the side of too great conciseness, while others are so full of all manner of specialized information it is questionable whether they are fitted for the use of nurses at all and are not rather general text-books. It should not be forgotten that the object of all text-books for nurses is to give them assistance in practical work. A happy mingling of theoretical knowledge with the requisite technical instruction required by practical work seems to have been attained in the volume before us. The lessons are progressive and so arranged as to unfold anatomy and physiology to nurses in a natural, helpful manner. The physiological discussions follow easily upon anatomical descriptions in such a manner as to make an impression upon the student.

The volume is beautifully printed and well illustrated, and the author deserves much credit for her work as compiler. The glossary and index are especially satisfactory.

BOOKS RECEIVED.

A Collection of the Published Writings of William Withey Gull, Bart., M. D , F. R. S. Edited and arranged by T. D. Acland, M. D. Medical Papers. 8vo, 600 pages. 1893. Published by the New Sydenham Society, London.

A Dictionary of Medicine, including general pathology, general therapeutics, hygiene and the diseases of women and children. Edited by R. Quain, assisted by F. T. Roberts and J. M. Bruce. With an Amer. appendix by S. T. Armstrong. New edition, revised throughout and enlarged. 4to. 1894. 2 vols. D. Appleton & Co., Publishers, New York.

A History of Epidemics in Britain. By Charles Creighton. Vol. II. From the extinction of plague to the present time. 8vo, 883 pages. 1894. University Press, Cambridge.

A Manual of Modern Surgery, General and Operative. By J. C. Da Costa, M. D. (Saunders' New Aid Series), 1894. 12mo, 809 pages. Published by W. B. Saunders, Philadelphia.

A Monograph on Diseases of the Breast. Their Pathology and Treatment. With special reference to Cancer. By W. R. Williams, F. R. C. S. 8vo, 572 pages. 1894. John Bale & Sons, Publishers, London.

INDEX TO VOLUME V OF THE JOHNS HOPKINS HOSPITAL BULLETIN.

THE

JOHNS HOPKINS HOSPITAL

BULLETIN

Volume VI.

CONTENTS.

THE POSTURE OF THE HEAD IN ACCIDENTS WHEN THE PATIENT IS UNDER AN ANÆSTHETIC.

BY H. A. HARE, M. D., *Professor of Therapeutics in the Jefferson Medical College of Philadelphia.*

[*Read before the Johns Hopkins Hospital Medical Society, November 19th, 1894.*]

In the presence of an accident from an anæsthetic the physician at once resorts to artificial respiration, after administering circulatory stimulants, and carries out his object by resorting to one of the several methods generally recommended for this purpose.

Be this method what it may, some studies which have been made with Dr. Edward Martin lead me to believe that it is of little value if the posture of the patient's head and neck is not córrect, since the positions naturally assumed by the head of the patient at such times are generally capable of making all efforts at artificial respiration difficult or impossible.

As long ago as 1889, Howard, of London, published a very interesting paper on this topic which has since been widely quoted. While recognizing the value of his studies, my own have led me to reach somewhat different conclusions in regard to the posture of the head and its influence on the patulousness of the windpipe, and it is to these studies that I ask your attention. Howard's statements in regard to the rôle of the epiglottis in cases of arrested respiration in anæsthesia are as follows:

1. The epiglottis falls backward in apnœa and closes the glottis; therefore the first thing in order and importance is the elevation of the epiglottis.

2. Traction upon the tongue, however, whatever the force employed, does not and cannot raise the epiglottis, as supposed.

3. The epiglottis can only be raised by extension of the head and neck.

The question which naturally arises first, is Howard correct in regarding the epiglottis as the cause of the obstruction? Personally, I believe he is wrong, because in the great majority of cases the air passages are at once cleared of obstruction simply by drawing the tongue forward, a method resorted to by all of us, yet one which, as Howard himself states, and as we have proved, has absolutely no effect on the epiglottis unless the traction is applied well back on the dorsum of the tongue by a tenaculum. We may conclude, therefore, that the epiglottis is not the chief cause of the obstruction and that the tongue is more frequently at fault, but as any obstruction is undesirable, and as the epiglottis does sometimes certainly partially close the windpipe, what shall be done to govern its position? Howard states that this may be accomplished solely by the posture of the head. The method which he recommends is as follows:

"Having, by bringing the patient to the edge of the table-bed, or by elevation of the chest, provided that the head may swing quite free, with one hand under the chin and the other on the vertex, steadily but firmly carry the head backward and downward; the neck will share the motion, which must be continued till the utmost possible extension of both head and neck is obtained. Sometimes a slight elevation and extension of the chin will at once check stertor or irregularity

of breathing; but understand, the extension, which can in no case do harm, should always be rather more than appears necessary. It should never be forgotten, however, that the full effects of extension as above described can be secured with certainty only by making the extension complete as directed."

Once more the studies which I have made of this subject have convinced me that Howard's advice is not practically valuable. Although there can be no doubt that the changes described are produced, so far as the position of the epiglottis is concerned, on the other hand such a position of the head and neck as he directs has the effect of strapping the soft palate over the dorsum of the tongue, thereby cutting off the entrance of air through the mouth and renders the nostrils the only path for its entrance. As the nasal cavities are in many persons obstructed by exostoses, hypertrophies or polyps, the nostrils do not afford a sufficiently certain entrance space for air, and removal of glottic closure by this posture may cut off the air higher up.

If, on the other hand, the head is extended and simultaneously projected forward, both the tongue and epiglottis are raised and the soft palate is so drawn as to permit of free breathing through the mouth as well as the nose. This is shown in the specimen which I now show you, in which the basilar process of the occipital bone is chipped away and the naso-pharynx exposed.

Returning to the question of the various modes of performing artificial respiration, such as Sylvester's or Marshall Hall's, let us see what accurate measurements of the volume of air pumped into the chest show as to their relative value. To determine this point the respiratory tract was connected with an ordinary gas meter, properly adjusted by means of a two-way tube, through one valve of which the air entered readily, while it could only escape through the meter. Curare was used to prevent voluntary breathing. When the Sylvester method was used the quantity of air passing out of the chest equalled 62; when that of Marshall Hall was employed the quantity was represented by 22. In another experiment the Sylvester method gave 18, while the Marshall Hall gave 8. It is evident, therefore, that the Sylvester is actually, as we have long believed it to be, by far the best method. In this connection it was found that in Sylvester's method it is vitally important to have an assistant grasp the feet and hold them motionless, since in this way the extension and upward traction of the arms above the head elevates and dilates the chest. This particularly is the case in children and persons of small weight, as the lower segment of the body readily follows the chest in its upward movement.

Very closely connected with the questions first considered is the condition of the respiration, so far as its nervous control is concerned, in accidents from chloroform and in shock and cerebral concussion. The position of the medical profession is at present uncertain in regard to the dominant action of chloroform, chiefly because of the contradictory views expressed by special students of its powers, and the teaching of certain leading therapeutists and surgeons whose opinions are radically different. Further than this, many experimental investigations have seemed to reach quite different results and

have apparently left the subject more clouded than ever. Aside from the question, long since settled, that chloroform is the more dangerous anæsthetic in its immediate effects, we may without difficulty reconcile nearly all the contradictory results so far obtained if the individual researches are carefully studied, and as a result of such reconciliation reach the absolute conclusions so necessary in so important a subject. The conclusions are as follows, namely, that after its primary effect on the vaso-motor system, the dominant action of chloroform is certainly upon the respiratory centres in the medulla, and that this effect is the cause of death in most cases of chloroform accident. Not only does nearly all experimental work teach us this, but in a collective investigation made by me some time since as to the cause of death in man under chloroform, nearly every case reported was found to have suffered primarily from respiratory arrest. These statements are based first upon the report made by myself and my assistant, Dr. Thornton, to the Hyderabad government in India, and upon the confirmatory but entirely independent studies of Randall and Cerna recently completed in Texas, in which these investigators took up the study to prove that our studies were erroneous and were forced to admit that death is due to respiratory failure.

Believing then that death is generally due to this cause when chloroform is given, it is incumbent upon the anæsthetizer to watch the respirations, both because death creeps on in this way, and also because the rapidity and depth of breathing governs the dose of the drug, for the dose is not the amount poured on the inhaler but the amount taken in vapor into the chest. Lawrie's assertion that chloroform should be given only while the respirations are regular and withdrawn as soon as they are stormy is most wise.

While I believe the respiratory action to be the dominant one in producing death as a rule, no one who has studied the effects of chloroform can deny that death may occur under its influence, in cases which are diseased, by its cardiac effect. Any shock may kill a case of cardiac disease, and it is natural therefore that any drug which possesses the peculiar influence of chloroform over the heart may be prone to cause death in this way.

In other words, supposing that the amount of depression from very full doses of chloroform equals 25 units, this amounts to little in the normal heart; but if the heart be depressed 25 additional units by disease, the depression of 50 units may be fatal, particularly if to this 50 is added 25 units more of depression through fright and cardiac engorgement, through disordered respiration or struggling. That true depression of the heart-muscle may take place under chloroform seems to us most undoubted, as we think that the tracings in every research that we have seen support this view. There is always a decrease in cardiac power manifested by the decrease in the force of the individual pulse-beat, and this passes away only if chloroform is removed early enough. We also agree with McWilliams that from the very first inhalation of chloroform there is a constant tendency to cardiac dilatation.

Closely associated with influence of chloroform on the vital functions is its influence upon the blood-vessels, which, as
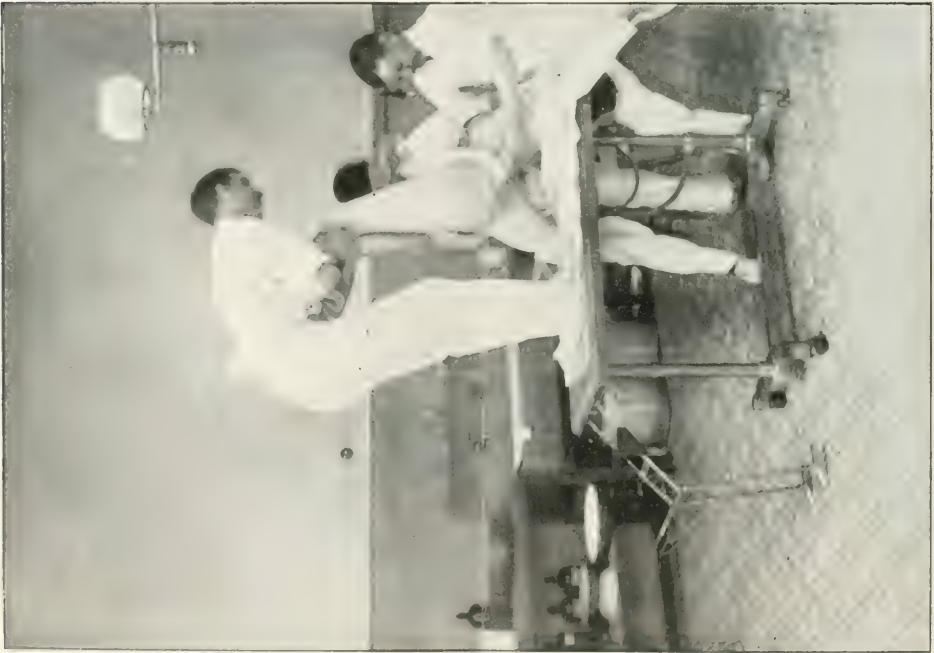
FIG. II. EXPIRATORY MOVEMENTS.
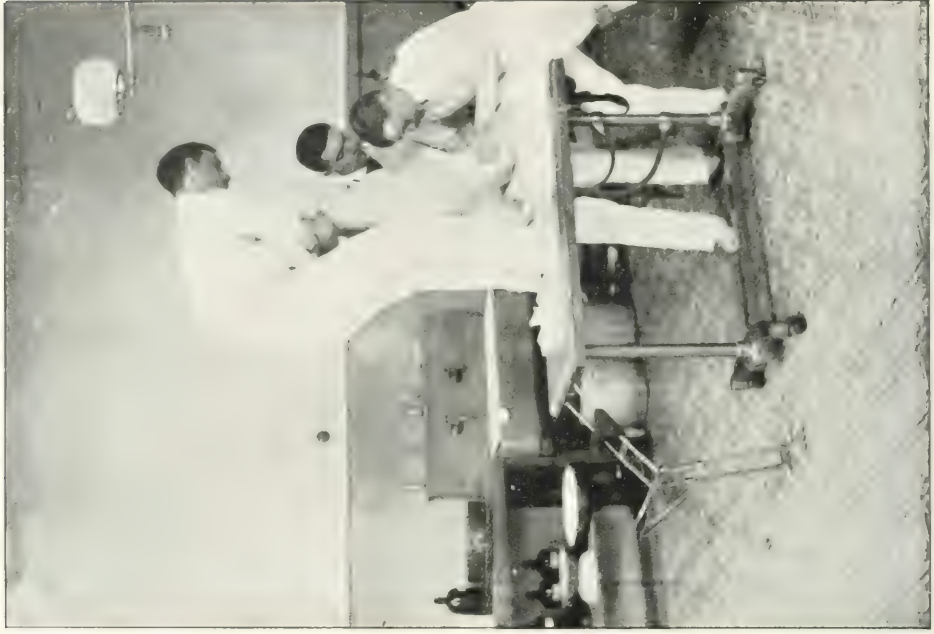
FIG. I. INSPIRATORY MOVEMEMTS.

already stated, is its primary and dominant effect. This influence I believe to be very much more worthy of attention than is generally recognized. Every physiologist knows that the action of the heart and respiration is greatly influenced by vaso-motor relaxation. The gasping respiration of sudden faintness is probably due more to sudden vascular dilatation than to direct failure of the heart, and the exceedingly rapid pulse of shock is seen in conjunction with the relaxed blood-vessels so characteristic of this state. The integrity of the vaso-motor system is as necessary to life as the integrity of the heart, since it is under the government of this system that the cardiac mechanism is active and the vital interchanges take place throughout the body. Acting upon this belief I have found both in the laboratory and at the bedside that atropine enables more chloroform to be given without circulatory depression than can be used if no atropine is administered, and there is good reason to believe that the use of atropine by surgeons for the purpose of stimulating the respiratory function, or preventing cardiac inhibition by irritation of the vagus, in reality prevents dangerous symptoms chiefly by its vaso-motor influence.

For some months I have been interested in studying the condition of the respiration in cases of traumatic shock, and it is surprising to note how death comes from failure of this function in distinction from failing circulation. Further than this, the employment of artificial respiration in these cases will often save life.

Very recently, in cerebral concussion, Horsley has called attention to these facts and has practiced artificial respiration with good results in apparently hopeless cases.

DISCUSSION.

Dr. KELLY.—We give chloroform frequently in the Gynæcological Department, and, although in a very dangerous atmosphere, I also gave it in Philadelphia a great many times, before coming to Baltimore, but always in dread, because Dr. Wood of the University of Pennsylvania had said that any surgeon having a death from chloroform should be indicted for murder. The main reason why Philadelphia surgeons are afraid of chloroform is because they do not know how to give it. In abdominal surgery chloroform is better than ether, as it gives a quiet anæsthesia, rapidly produced, and its after-effects are not so disagreeable. My personal preference, save in cases of grave cardiac complications, as a dilated heart, or where there is failure in compensation, is always for chloroform. As I leave the choice of the anæsthetic, however, to my anæsthetizers, I find that in a large majority of cases they select ether. I never ask an assistant to give chloroform who is averse to it, especially if he has not been accustomed to its administration. The man who administers chloroform should be afraid of his anæsthetic. He should watch his patient closely, and constant attention should be given to respiration, pulse and general appearance. Since the results of Dr. Hare's researches have been published, in which he proves that the respiration is the important factor and fails first before the heart, we pay more attention to the respiration than before.

Regarding methods of resuscitation, I have found a method of my own exceedingly satisfactory. I have treated about fifteen cases with uniform success by this method, which I believe to be the best for keeping up artificial respiration. I find too that I have been following the principle laid down by Dr. Hare—that of the extended and slightly flexed head. On the first indication of failing respiration the administration of the anæsthetic is instantly suspended, and the wound protected, if abdominal, a broad piece of gauze is laid over the intestines under the incision. An assistant steps upon the table and takes one of the patient's knees under each arm, and thus raises the body from the table until it rests upon the shoulders. The anæsthetizer in the meanwhile has brought the head to the edge of the table, where it hangs extended and slightly inclined forward. This position, shown in the accompanying cuts, is similar to that described by Dr. Hare and resembles that taken by the runner when he is breathing hard. The patient's clothing is pulled down under her armpits, completely baring the abdomen and chest. The operator, standing at the head, institutes respiratory movements as follows: inspiration by placing the open hands on each side of the chest posteriorly over the lower ribs, and drawing the chest well forwards and outwards, holding it thus for about two seconds (Fig. I); expiration, reversing the movement by replacing the hands on the front of the chest over the lower ribs and pushing backwards and inwards, at the same time compressing the chest (Fig. II). The success of the manœuvre will be demonstrated by the audible rush of air in and out of the chest.

The heart and pulse should be constantly watched. As respiratory movements are continued, a little flickering pulse-wave will be observed at the wrist, which shortly becomes faint and regular, and gradually increases in strength. From ten to thirty of these acts of induced respirations will usually suffice to excite voluntary respiratory movements, which begin with short, jerky, gasping breaths, becoming louder and then regular. The movements must then be timed to suit the natural efforts. As the depth of inspiration increases, the color slowly returns, the pupils contract, and the danger is past. In women with contracted, fusiform chests (tight lacers), this procedure is not available; in such cases respiration should be induced by direct antero-posterior compression of the chest by placing one hand on the lower third of sternum, and the other on the back opposite the first, and alternately squeezing the chest and relaxing the pressure, when air will be audibly forced in and out, and the patient revived as by the previous method; it also fails in a rigid old chest.

The suggestion which Dr. Osler once made concerning the use of external heat during the administration of an anæsthetic in a prolonged or a severe operation is a most important one. Dr. Osler especially impressed me with this fact two years ago on his return from London, where he had seen Horsley conduct his experiments in brain surgery on monkeys which were kept on a warm table during the operations. Horsley lays great stress on keeping up the body temperature, to prevent shock. Following this suggestion, I have recently had bottles hot water bags made three and four, which we keep in the operating room, and in case the operation is to be prolonged, or the patient is feeble, we place one or other side of the

body and an ordinary water-bag at the feet. I am indebted to Dr. Hare for several important hints, especially concerning the use of atropine in cases of disturbed respiration. I am also glad that he has placed the principle of the proper position of the head upon a scientific basis.

DR. OSLER.—With reference to the position which Dr. Kelly puts the patient into, I will mention the very interesting experiments made in Dr. Sanderson's laboratory in Oxford by one of his assistants upon the influence of position on blood pressure. With a very carefully adjusted turn-table, the blood pressure was found to rise immediately as the lower extremities of the animal were raised.

DR. HALSTED.—I am pleased to hear what Dr. Hare has said, and I am sure that the position of the head which he advocates is the correct one. It is the position which we always use. We have learned to use it from experience. Dr. Hare said "Now you have got the position," when I was testing on the cadaver our position in order to see whether or not it opened the glottis. In pulling the jaw forward as we do it, one necessarily extends the head. In anæsthetizing a patient we always catch the jaw close to the condyle and press it as strongly forward as possible, and so keep the glottis open. If this is properly done it will never be necessary to pull the tongue forward with an instrument. It is not, therefore, the extending of the head which opens the glottis. If, we were to extend the head by pulling the ears we should not open the glottis. The extension of the head is simply incidental to the drawing forward of the jaw. I agree with Dr. Hare when he suggests that we might make use of atropia oftener than we do. It is a drug upon which we can rely to increase arterial tension. But morphia is a vaso-motor depressant and lowers arterial tension; hence I do not use it in conjunction with ether. I am afraid of chloroform and do not use it. In Germany, where they certainly ought to know how to give it, where they use it almost exclusively and write a great deal about the proper method of administering it—giving it drop by drop, a drop with each inspiration—they have had more deaths this year than ever before from chloroform, 1 to 1600 or 1700, according to Gurlt's statistics. For the last ten or twelve years Gurlt has, as you know, gathered statistics from the different German universities. The usual mortality is 1 to 2200 or 2300. This year from every university in Germany, almost without exception, the mortality from chloroform has been greater than for many years. That is very remarkable unless the manufacturers of chloroform are to blame. One death should be enough to deter a man from ever using it again. Dr. Lange took Dr. Kelly's attitude for a good many years, then he had a death on the table and said that he would never give chloroform again. It is perhaps possible to give morphia in so small a dose that it may for a few moments act as a vaso-motor stimulant and increase the arterial pressure, but in moderate and particularly in large doses it lowers arterial tension most pronouncedly. These statements are supported by the highest authorities,* and I take pleasure in calling Dr. Hare's attention to them.

DR. HARE.—A characteristic symptom of the first stage of opium poisoning is a slow, full and strong pulse, and therefore the arterial pressure must be high.*

There are one or two points raised in the discussion that I would like to speak of.

I thoroughly agree with Dr. Kelly, although I am one of the much maligned Philadelphians in this instance, when he says that many persons don't know how to give chloroform in Philadelphia. In two of the cases in which I have seen accidents occur, the chloroform was given very much more as if it was ether than if it were chloroform; and in the last case I saw, after the woman was once resuscitated, the resident physician two minutes later pulled the napkin over the patient's mouth and poured on about ½ ounce of chloroform so that her pulse was lost at the wrist and her breathing stopped a second time.

In regard to atropine, I think we do not use large enough doses of this drug. When I was a student a proper dose of atropine was 1-250 gr. and of strychnine 1-160. Now some surgeons give as much as ½ gr. of strychnia, and atropine in the dose of 1-100 to 1-50. Atropine is a better drug than we think it is, and does not get the credit it ought to have, simply because we do not give it in large enough doses. One one-hundredth of a grain would be a very proper dose, and I have given myself, in cases in which I had reason to believe there was a condition of vaso-motor relaxation, very much larger doses, proportionately, than this. In a child of 8 months I have given 1-150 gr. of atropine twice in 8 minutes, and I believe that it saved the child's life.

This leads me to emphasize one other point which I am almost afraid to speak of, because I have emphasized it so often, particularly to the students of Jefferson College: I am confident that we let many cases die on account of vaso-motor relaxation. When you see the diagrams in the books on physiology, of the enormous area of the vascular system when relaxed and the capacity of it as compared with the arteries and veins, and when you read of the influence of vaso-motor relaxation in producing tachycardia and cardiac exhaustion, then you can appreciate the importance of the vaso-motor system in maintaining life. In pneumonia, when you have a very feeble and very rapid heart, don't think that because the heart is rapid digitalis should be given. It is extraordinary the way the action of the heart will improve just as soon as you develop the normal resistance of the vascular system. The heart working against a relaxed vascular system is in a worse condition than when working against a vascular spasm such as we have in chronic nephritis.

Morphiniumnarcose. Verhandlungen des Cong. fur innere Med. 1886.

Binz : Discussion of Fick's paper. " We have learned to-day from Dr. Fick, by reason of his exceedingly precise methods of investigation, that morphia in doses which are not large weakens the heart's systole, and therein lies a fresh proof of the old experience that morphia is a heart poison of such power that it may endanger the central organ of the circulation."

HARNACK : Arzneimittellehre und Arzneiverordnungslehre, p. 650.

* DR. HALSTED.—With the slowing of the pulse the fall in arterial pressure increases. *Vid.* Binz, Heubach, Fick and others.

* C. BINZ : Ueber den arteriellen Druck bei Morphium-Vergiftung. Deutsche med. Wochenschr. 1879 and 1880.

Fick : Ueber die Blutdruckschwankungen im Herzventrikel bei

Since Dr. Halsted has fired a shot at the therapeutist, I will have to have a shot at the surgeons in return. Dr. Abel will agree with me when I state that morphia is not a vaso-motor depressant; on the contrary, it is recognized as quite a powerful stimulant to the heart and vaso-motor system in ordinary doses.

The position I want to emphasize about the head under these circumstances is that it should be extended and craned forward in order to let the air pass in. One of the deaths I saw, which occurred in Dr. Goodell's practice, was due, I am confident, to respiratory failure. I took charge of the head and Dr. J. Wm. White used Sylvester's method of artificial respiration, and it was interesting to notice the difference in the respiratory sounds when the head was in the ordinary position and when it was pushed forward in the way I have described.

The last point perhaps may have some relation to the question which Dr. Halsted has brought up in regard to why it is that in some years there are more deaths than in others. So far as I know, there have been no carefully carried out experiments in regard to the fatality of chloroform under varying conditions of the atmosphere. In Galveston there are very few deaths from chloroform. Lawrie has now had about 30,000 chloroform anæsthesias without a death, and only a few accidents, not alarming. Perhaps it is that the condition of the temperature of the air—humidity and barometric pressure may have something to do with the quantity of chloroform which is taken into the chest, for it is not the quantity of chloroform that is put on the towel, but the quantity of chloroform which the patient takes into his lungs from the towel that is to be considered. This emphasizes still further Lawrie's statement that just as soon as the patient's respiration is getting stormy we must stop the administration, because if you do not do so you will not know how much chloroform the patient is getting.

Dr. Abel.—The question is a matter of dosage. Small or therapeutic doses of morphine have no effect to speak of on blood pressure. It is a very different matter when toxic doses have been taken. It is a notable fact that morphine has a more powerful action on the respiratory centre than on the vaso-motor centres.

I have listened with great pleasure to Dr. Hare's interesting paper. His report to Lieutenant-colonel Lawrie, of the Hyderabad commission, to which he has made reference in his remarks to-night, contains valuable confirmatory researches on the effect of chloroform on the respiration and circulation, and all of us, I feel sure, will agree with him in his conclusions on these points.

The question has been raised to-night of the relative value of ether and chloroform. I was myself brought up under a chloroform regime, and when I first began to teach I put it rather more highly in the list of anæsthetics than I am inclined to do to-day. The Germans are now making a careful examination of the comparative merits of chloroform and ether. Many of their surgeons who have hitherto favored chloroform above ether are turning about and it would appear that chloroform is going to lose the day. Laboratory investigations are giving us fresh proofs of the greater safety of ether.

Chloroform has a remarkable affinity for some of the substances composing the nervous system. The brain and the medulla seem able to pack it away even when it is breathed in very dilute air solutions. Thus Kronecker and Cushing have found that the breathing of air containing only 0.34–0.42 per cent. by volume of chloroform will still lead to paralysis of the respiratory centre; and Pohl, following out some early work of Schmiedeberg's, has shown that in the stage of complete anæsthesia the brain contains about three times more chloroform than an equal weight of blood, blood containing 0.015 per cent. and brain substance 0.0418 per cent. chloroform. We have some information, therefore, as to the localization of chloroform in the body. Schmiedeberg long ago demonstrated that the serum of the blood contains very little chloroform during anæsthesia, not more than would be dissolved in water, and that the chloroform taken up and carried by the blood is bound to its red and white corpuscles. From experiments made by Pohl we know that it is the lecithine, cholesterine, fatty matters, and the protagon of the corpuscles of the blood and of the cells and fibres of the central nervous system to which the chloroform is tied. What proportion of chloroform is taken up by such viscera as the liver we do not yet know.

If so weak a solution as 0.5 per cent. of air volume will still, after being breathed for some hours, cause cessation of breathing, that is rather against chloroform, even in the light of modern improvements in its administration. Paul Bert in 1884 proposed that only a "titrated" air solution, containing at the most no more than 4 per cent. of chloroform, should be used for anæsthetic purposes. This method was employed for a time by a few practical anæsthetists (Clover) and is said to have reduced the number of chloroform accidents. But for some reason or other, either because accidents still occurred or because the required apparatus was cumbersome, the method was given up.

The method of le mélange titré is, however, being revived, only ether is being used instead of chloroform. Dr. Spenzer, an American chemist, working in Schmiedeberg's laboratory, has found that the inhalation of air containing 1.5 per cent. of ether by volume, for two hours, causes no anæsthesia in animals, the result being only a mildly hypnotic condition. If the air breathed contained 2.5 per cent. of ether by volume the anæsthesia was also found to be entirely incomplete, the reflexes in this instance being exceedingly lively. When the respired air contained 3.19 [...] per cent of ether, complete anæsthesia was attained with [...] up for hours without any respiratory disturbance whatever, and without damage to the heart. When 4.45 per cent. by volume of ether was employed, anæsthesia was complete within fifteen minutes, the breathing was slower but regular, the heart-beats a little more rapid and weaker than normally, but still of a regular rhythm. At 6 per cent. by volume of ether admixture the limit of safety was reached, for now cessation of the respiration occurred within 8–10 minutes after allowing the ether to be breathed. Artificial respiration, however, always restored the animal, no matter how often the experiment was repeated. Spenzer's experiments, in which [...]

were made, thus substantiate Snow's results, gained many years ago (1858) by crude methods, that an air mixture containing about 3.5 per cent. by volume of ether will keep up an anæsthesia for many hours without endangering the respiration or circulation. We see, too, from Spenzer's experiments that even with ether there is but a narrow limit between safety and death.

This summer, in the pharmacological laboratory at Bonn, I saw an apparatus which allows us to give ether to human beings according to this safer method of *le mélange titré* with great success. The arrangement is such that the mixture can be made of air and ether in such proportions as you want it. It is then carried through valves that are so easily moved that there is no work of any consequence for the chest of the patient. I was told there that they had anæsthetized patients by this method with great success. A further advantage of this method is that air mixtures of ether that do not much exceed 4 per cent. are non-irritating to the mucous membrane of the respiratory tract. Dreser has made experiments on this point and has found that up to 5.4 per cent. by volume of ether vapor the mixtures were pronounced by his subjects to be easily borne.

The absence of knowledge as to toxic doses, that is, as to the amounts pro kg. of body weight from which no recovery is possible, is greatly to be regretted.

Unfortunately, too, we have, as far as I am aware, no careful experiments as to the localization of ether in the organs of the body, and no equally exhaustive experiments as to its chemical fate in the organism as compared with chloroform.

One other point in the way of chloroform is the tendency to degeneration of the important viscera after its use. You cannot chloroform the healthiest and strongest bulldog, notably a tough species of animal, two successive times without his dying from the after-effects of the drug. Keep him deeply under anæsthesia with chloroform for four hours, let him recover, and on the third day following repeat the experiment, keeping him again deeply under the influence of chloroform for four hours, put him away into his pen, he will regain consciousness as usual, but in the course of a few days death will ensue. Whether carefully wrapping up an animal in cotton wool would keep the animal alive after two such periods of heavy chloroforming I cannot yet say.

I have been much struck by the poisonous nature of chloroform in feeding experiments that I have undertaken for the purpose of studying changes in the metabolism of the liver. Repeated doses, even when not large, and single large doses (6–9 grams) according to the weight of the animal, soon cause a profoundly cachectic condition, the animal's coat becomes shaggy, it loses weight and in the course of 6–14 days it dies, no matter how healthy it was before. Others have demonstrated that in such cases a marked fatty degeneration of many organs, notably of the liver, kidneys and heart, has been induced. Kast and Mester have come to the conclusion after an examination of the urinary constituents, particularly of the so-called "neutral" sulphur compounds, that long-continued chloroform inhalation induces a profound disturbance in proteid metabolism, extending over several days. Of no little importance is the fact that it requires considerable time for the organism to get rid of chloroform, whether taken up from the lungs or from the digestive tract. This is demonstrated by the increased elimination of chlorides after chloroform anæsthesia, experiments on animals showing that the greater part of the chlorine of the retained chloroform is excreted in the form of chlorides, and that even on the fourth day after the administration of the chloroform the urine still contains an excess of chlorides.

One reason then why the Germans are turning about is that their studies have led them to believe that many of the deaths that occur very shortly after a prolonged administration of chloroform are due to the serious lesions of important organs induced by this drug. Virchow's Archiv and other journals and the inaugural dissertations of the last seven or eight years have had numerous contributions on this subject.

A recent contribution by Selbach from the laboratory of Prof. Binz, entitled "Are fatal after-effects to be feared as resulting from long-continued ether inhalations?" reviews the literature on the untoward effects of chloroform, and describes a series of original experiments made with the view of determining the poisonous after-effects of prolonged etherization, and from these the author is led to infer that there is little or no danger of a fatal after-action following anæsthesia by ether in the case of human beings. Here too, then, on this important side of the question the advantage lies with ether.

DR. THEOBALD.—Regarding the use of atropine preceding the administration of chloroform, I may say that for a number of years I have been in the habit of giving a hypodermic injection of $\frac{1}{4}$ gr. morphine with $\frac{1}{150}$ of atropine previous to the use of chloroform, and the effect has been most satisfactory. Not only is the heart-depression in a great measure obviated, but the patient comes more quietly under the anæsthetic, and the recovery from the anæsthesia is slower and more satisfactory. The patient does not wake up suddenly with restlessness, but wakes up in a sleepy, good-natured state, and submits to the dressing with less objection.

A CONTRIBUTION TO THE STUDY OF ANÆSTHESIA BY ETHER.*

By Prof. extraord. H. Dreser, *of the Pharmacological Laboratory at the University of Bonn.*

Introductory Note by Prof. Abel.

Prof. Dreser has forwarded me the following paper in English for publication in this country. While his researches into the composition of the air in the closed masks described by him might appear to have less value for those that administer ether by the open method, yet a close reading of his exhaustive paper will prove of value to all anæsthetists alike. That a deficiency of oxygen can so easily be induced in a closed mask, and that there is more danger on this score than from the accumulation of carbon dioxide, are points that are well worth establishing. It must also be of great interest to know that mixtures of air and ether containing more than 7 per cent. by volume of ether vapor cannot be inhaled without great irritation to the mucous membranes of the respiratory tract. Prof. Dreser has devised most ingenious apparatus which makes it possible to anæsthetize patients with mixtures of air and ether of known strength. In a trial experiment, recently made in the gynæcological clinic of Prof. Fritsch,† at Bonn, a woman was kept under the influence of ether during an hour and twenty-one minutes, the time required for the performance of an operation for prolapse of the uterus, the anæsthesia being entirely satisfactory to the operators. Anæsthesia was first induced with a mixture containing 6 per cent. of ether, the mixture was then increased to 8 per cent. of ether until profound anæsthesia was attained, and then lowered to 4 per cent., at which strength it was maintained throughout the entire operation. All this was accomplished without depriving the air in the mask of its oxygen and without allowing the expired air to accumulate, the mask used containing two very simple and very mobile valves which separate the air to be inspired from that expired. It is to be hoped that Prof. Dreser's method of administering ether in the form of titrated mixtures will be found so practicable that anæsthetists will have no difficulty in employing it. The greater safety of such a method and its advantages in lessening the untoward after-effects of anæsthesia are evident.

<div align="right">John J. Abel.</div>

Even the healthiest person may by some accident, as a fracture, a dislocation or a wound, become a subject for the surgeon, who is then obliged to anæsthetize him in order to come up to the motto of his profession, to cure *tuto, cito et jucunde.*

The anxious feelings which a patient who may perchance know something of these matters must have before the beginning of an operation, will be increased by his suspicions as to whether either Julliard's or Wanscher's mask may be quite fit to prevent any accident occurring. This matter is therefore not only of scientific value, but also of a personal interest.

Such were the suggestions that occurred to me on the occasions when I witnessed surgical operations, and that induced me to make the analysis of the gas contained in the inner chamber of these masks.

I do not want to speak of the diverging assertions of clinical empiricism, but wish rather to furnish the precise data of analyses, in order that we may judge whether either method will prove efficacious and not dangerous.

Surgeons now try to substitute less dangerous agents, such as bromide of ethyl, ether, or pental, for chloroform, which is suspected of being a heart-poison. The vapors of these fluids, which are more volatile than chloroform, must accumulate in the air, to be inhaled in a far greater quantity than in the case of chloroform. Therefore the simple Esmarch mask used for chloroform is not efficient. The permeable cover of the Esmarch mask would bring about quite the contrary effect. The air exhaled by the patient being of a higher temperature than the surrounding atmosphere, a great quantity of ether would escape into the room; whereas the cooler atmosphere of the room, passing through the cover of the mask at the next inhalation, will carry too little ether into the patient's lungs.

For this reason the great basket-mask of Julliard has an impermeable cover of waxed taffeta, and the Wanscher mask has a bag of india rubber.

However, in spite of these differences, the principle which led to their construction is the same, viz. to have a pretty large fore-chamber close to the nose and mouth of the patient. The warm air exhaled must remain in this chamber until the next inhalation, and by parting with its store of heat causes a more rapid evaporation of the narcotizing fluid. In Wanscher's mask, if it fits the patient's face well, the exhaled air will remain entirely in the india rubber bag; in Julliard's mask it only partially remains. Thus the anæsthetic vapors will reach the lungs of the patient in sufficient quantity, perhaps more even than is required.

The question now is, whether the air thus tarrying under the mask and breathed again may not gradually be robbed of its oxygen and overloaded with carbonic acid; and in this event these two methods of applying anæsthetics would have to be considered dangerous.

Before giving the results of my analysis of the gas met with in the masks, and the physiological conclusions to be drawn from it, it is necessary to state the methods which I used.

A. The Method Used in Obtaining the Gases in the Masks and in Determining their Volume.

A small quantity of the gas mixture inhaled to be analyzed was drawn from the inner chamber of the mask by means of glass tubes joined together with india rubber in a conduit, thus yielding without breaking to every movement of the patient. This conduit had been previously filled with concentrated salt water in order to avoid as much as possible any absorption of the gases. The end portion of this conduit, had

* Researches on the composition of the air in the masks of Wanscher and of Julliard during anæsthesia by ether.

† H. Dreser: Demonstratio eines Apparates für Herstellung dosirter Aetherdampf-Luftmischungen. Sitzungsb. d. Niederrhein. Gesellsch. f. Natur- u. Heilkunde zu Bonn.

like a knee, was introduced between the border of the mask and one side of the nose. The estimation of the volume of the compounds was made according to Prof. Hempel's expeditive method for the technical analysis of gas.* As the solubility of ether vapor in water is not inconsiderable, one must use concentrated salt water instead of ordinary water, or else the percentage of the ether vapors would fall short of that actually present, especially when the analysis is not done quickly.

I have tested in the following way the possibility of transferring ether containing air into Hempel's burette with sufficient accuracy by using concentrated salt solution as a separating fluid. Fifty cc. of air were measured into Hempel's burette and propelled into a vessel filled with salt solution saturated with ether. On shaking the air in this vessel, its volume was increased by the ether evaporating from this salt solution. In order to prove how much the volume in the shaking vessel might have diminished after carrying it back into Hempel's burette and measuring its new volume, the lower end of the shaking vessel was joined to a 100 cc. pipette by a rubber tube. After shaking, the pipette was filled with salt solution to its upper mark, placed on the same level as the fluid in the shaking vessel. Having again transferred the gas into Hempel's burette and noted its volume, the remainder of the 100 cc. salt solution in the pipette was weighed, and by means of the specific gravity of the salt solution the volume of air increased by the vapors of ether was calculated. The difference between the measured and the calculated values of the gas volume may be shown by the following table:

	Read off.	Calculated
I	64.0 cc.	64.25 cc.
II	80.2	80.02
III	69.7	69.85
IV	86.8	86.97
V	62.4	62.35
VI	67.8	68.02

Hence it is clear that the difference is about 0.2 cc. when using salt solution as a separating fluid.

A few explanatory words about the absorption of the narcotizing vapors in the analysis must be given. Hempel's experiments in 1891† proved that the vapors of carburetted hydrogen are readily absorbed by absolute alcohol. I made experiments proving the absorption of ether and bromide of ethyl by means of Hempel's "Aethyleupipette"‡ filled with absolute alcohol, using, however, the precaution of not letting the alcohol rise up to the caoutchouc of the connecting capillary tube. The gas to be analyzed was repeatedly propelled and carried back until two equal volumes were noted. Thus I have proved that any further absorption is impossible; but the volume of the remaining gas was still too great, because it contained some alcohol vapors. These vapors are easily removed by tilting the closed burette and moistening its walls

with the separating fluid. The efficacy of this method can be tested by introducing 100 cc. of pure air into the alcohol pipette. The air carried back into the burette is increased by the alcohol vapors to somewhat more than 100 cc.; after tilting, the original 100 cc. will be found again.

TEST FOR THE ANALYSIS OF ETHER AND BROMIDE OF ETHYL.

	ETHER.			BROMIDE OF ETHYL.		
	Air	Air increased by the vapors.	Air free from vapors.	Air.	Air increased by the vapors.	Air free from vapors.
I	50.0 cc.	59.8 cc.	50.2 cc.	50.0 cc.	59.2 cc.	50.0 cc.
II	``	56.8	50.1	``	56.6	50.2
III	``	65.4	50.2	``	58.6	50.1
IV	``	60.2	50.0	``	56.0	50.2
V	``	63.8	50.2	``	56.6	50.0
VI	``	62.2	50.2	``	64.4	50.3

B. OBSERVATIONS ON ANÆSTHESIA BY BROMIDE OF ETHYL BY MEANS OF WANSCHER'S MASK.

The following 24 observations were made during *shorter surgical observations*. The Wanscher's mask used had a sponge near the metallic mouthpiece of the mask, upon which the liquid was poured. The free border of the mouthpiece was formed by an india rubber roll inflated with air in order to make it fit tightly to the patient's face. Nevertheless the mask did not always fit quite closely, because many a patient struggled vigorously at the very beginning. This may be one reason for the somewhat different percentages found in the proofs of air taken out of the mask.

No.	BrC₂H₅ vol. per ct.	CO₂ per ct.	O₂ per ct.	Remarks.
I	8.0	2.2	12.4	Proof taken after 1–1½ minutes.
II	8.2	3.0	10.6	`` `` `` ``
III	4.2	12.0	7.1	`` `` `` 3–4 ``
IV	6.8	2.2	14.6	`` `` `` 1–1½ ``
V	4.0	2.2	16.2	`` `` `` 30–40 seconds.
VI	6.2	3.3	13.6	
VII	5.4	2.4	14.7	
VIII	2.4	1.6	18.4	`` `` `` 20 seconds.
IX	5.0	2.2	14.6	
X	6.8	2.2	13.0	`` `` `` 55 seconds to 1 min.
XI	7.7	2.9	13.2	
XII	4.0	2.2	16.4	`` `` `` 30–40 seconds.
XIII	12.0	2.6	11.6	`` `` `` `` struggling much.
XIV	4.0	3.2	13.4	`` `` `` 2 minutes.
XV	7.2	3.8	10.6	`` `` `` 1 minute, struggling.
XVI	9.6	2.9	11.8	`` `` `` 1½–2 minutes.
XVII	10.6	2.6	12.6	`` `` `` 35–45 seconds.
XVIII	12.8	2.8	7.4	`` `` `` `` struggling violently.
XIX	7.2	2.8	12.8	`` `` `` 50–55 seconds.
XX	7.8	2.2	12.8	`` `` `` 55 seconds.
XXI	2.4	2.6	16.4	`` `` `` 1 min.–1 min. 10 secs.
XXII	13.8	1.8	12.8	`` `` `` 80 seconds.
XXIII	10.0	2.8	10.4	
XXIV	14.6	1.9	13.1	`` `` `` 1 minute.

The limits were 2.4–14.6 per cent. of bromide of ethyl, 2–3 per cent. of carbonic acid (with one single exception); the differences were mostly found in the percentages of oxygen, varying between 7.1–18.4 per cent.; the average was 12–14 per cent. O₂. It was necessary to extend these

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* Gasanalytische Methoden von Walther Hempel. 2te Aufl. 1890.

† W. Hempel und G. M. Dennis: Über die volumetrische Bestimmung der dampfförmigen Kohlenwasserstoffe. Ber. d. deutsch. chem. Ges. zu Berlin, 1891, p. 1162.

‡ Hempel: Gasanalyt. Methoden, p. 182.

C. Inquiries to Healthy Persons without Narcotizing them.

· This furnished me with a much-wished-for opportunity to compare the feelings of conscious individuals breathing under the mask, concerning the percentage of the air met with in the inner chamber of it. The experiments were performed on men sitting perfectly quiet. The proofs of gas were taken after breathing half a minute, one minute, and two minutes. We had the following results:

After half a minute.

Dr. A. K.		St. K.		H. D.	
CO₂ per ct.	O₂ per ct.	CO₂ per ct.	O₂ per ct.	CO₂ per ct.	O₂ per ct.
5.8	13.6	5.3	13.9	5.0	15.4
5.6	13.8	5.5	14.3	6.2	13.6
6.2	13.5	5.8	14.0	6.6	12.3
6.0	13.9	4.8	15.4	7.6	11.8
5.4	14.2	5.4	14.4	6.0	14.2
5.6	14.0	5.6	14.6	6.3	12.9

After one minute.

7.2	9.7	6.5	12.5	6.6	11.6
6.4	10.6	5.6	13.6	6.8	10.6
6.2	11.2	6.2	12.6	6.2	12.6
6.9	10.1	6.2	12.8	6.6	11.8
7.0	9.8	6.8	11.2	7.6	9.8
7.0	9.8	6.6	12.2	7.4	10.6

After two minutes.

6.2	9.6	7.8	8.8	6.4	10.4
7.2	6.4	7.8	9.4	6.8	10.6
7.6	6.0	7.7	7.1	7.0	8.8
7.8	5.0	8.8	5.8	8.2	6.0
7.0	8.0	8.0	6.6	7.8	7.4
6.0	10.8	8.2	6.4	7.0	9.5

The differences in these experiments are not quite so considerable as those met with in the narcosis by bromide of ethyl, yet they were greater than was expected. The reason was the different volume of the air extant in the india rubber bag, which varied according to the more or less deep folds of it.

In the experiments with bromide of ethyl, the air in the mask seemed to be especially impaired by loss of oxygen when the patients had been struggling. On that account I engaged a student to take exercise with dumb-bells in order to study the influence of muscular exertion on the composition of the air in the bag. The dumb-bells used weighed 12 kilos, the height to which they were lifted up being 1.25 meters; the work done with each lift was 15 kilogrammeters. There were 8–9 lifts in half a minute; the work done in this time was 120–135 kilogrammeters, and 240–270 kilogrammeters during one minute. When sitting perfectly quiet the following composition was found: .

After half a minute.		After one minute.	
CO₂=4.4 per cent.	O₂=16.0 per cent.	CO₂=5.8 per cent.	O₂=13.4 per cent.
5.9	14.4	5.6	13.2
6.2	13.8	6.9	11.9

When working, was found:

After half a minute.		After one minute.	
CO₂=8.2 per cent.	O₂=10.6 per cent.	CO₂=8.0 per cent.	O₂=9.4 per cent.
7.9	9.7	8.9	11.0
7.2	11.4	7.0	10.4
6.2	12.5	6.6	11.4
6.8	11.0	7.4	10.0
		8.2	7.6

The results of all these experiments without narcotics show that the oxygen contained in the bag of the mask decreases so rapidly that after having breathed for half a minute in the mask, the light of a candle is extinguished in this air. I found that the percentage composition of air in which a candle had gone out was 16.2–15.4 per cent. O₂ and 3.6–4.6 per cent. CO₂. Cl. Bernard* has obtained corresponding numbers, viz. 15.4 per cent O₂ and 2.3 per cent. CO₂. After having breathed for one minute in Wanscher's mask, the partial pressure of oxygen had sunk to one-half of its pressure in the atmosphere —a limit when bad symptoms also began to appear in the well-known experiments of Paul Bert. After having breathed in the mask for two minutes only, 5–6 per cent. of oxygen were several times met with. The consequence was that very disagreeable oppression of the heart and violent dyspnœa were caused, so that the persons experimented upon were glad when the two minutes, the time of the experiment, were over. By comparing each single experiment we have evidence that it is not the percentage of carbonic acid, but only the diminished oxygen, which is the cause of this state of suffocation combined with cyanosis of the face or slight dizziness. In the last experiment on the influence of muscular activity with only 7.6 per cent. O₂, violent dyspnœa was especially complained of. It is therefore clear that a partially narcotized patient who struggles to get rid of this dangerous state will make his condition rapidly worse by his muscular straining. By way of comparison with the various percentages found by me, I quote Cl. Bernard's experiments upon animals which died when the percentage of the air in the room had gone down to 3–5 per cent. O₂; in these experiments the exhaled carbonic acid was absorbed. In similar experiments of W. Müller the lethal limits were 1–5 per cent.; Stroganow found 3–4 per cent. O₂; Friedländer and Herter 3.8–2.1 per cent. The explicit researches of these latter investigators show that the diminution of the oxygen to 12.7 per cent. caused a little dyspnœa and a slight irritation of the vasomotor centers, producing only a small rise of the arterial blood pressure; but when the air breathed had only 5.1 per cent. O₂, the blood pressure rose 43 mm. of mercury above the normal. In these experiments on animals, air containing only 7.5 per cent. O₂ called forth a decided dyspnœa.

Now it may be clearly seen the Wanscher mask offers the unwelcome possibility that these states of deficiency of oxygen, already well known by experiments upon animals, will be reproduced in man in the course of a few (1–2) minutes. Among the numerous recommendations of the Wanscher mask at least some kind of information should have been given as to how often this mask should be replenished with air. The simple test with a burning candle, well known to any intelligent person would instantly prove that even if a continuous flow of fresh ether through the mask was a [...]

D. On the Influence of [...]

The recommendations of the Wanscher mask say little or [...]

These concentrations, which irritate the mucous membranes of the respiratory organs, are most important for the lungs of the patients. The frequent catarrhal affections of the bronchi and lungs met with after ether narcosis are caused by too strong concentrations of the ether vapors. In order to state the percentage of ether vapors still respirable without molestation, we experimented upon ourselves by breathing proofs of several mixtures made by diluting ordinary air with varying proportions of air saturated with ether vapor. These mixtures having been prepared in an india rubber bag, two or three persons breathed immediately one " proof," wrote down their sensations, i. e. whether they were "bearable," or caused some "irritation and cough," or "impossible to be breathed." Immediately afterwards a proof was taken out of the bag in order to determine the percentage of ether vapor. On the whole 18 experiments were made.

	Ether vapor. per ct.	
I	6.4	Two persons moderately irritated to cough ; the third very little.
II	8.8	None of the three could breathe in this mixture ; cutting sensation in the throat.
III	9.0	Same as II ; contraction of the glottis.
IV	7.2	Irritation and cough ; cannot be breathed over again.
V	8.6	Irrespirable.
VI	6.4	Moderately irritating ; two persons, "bearable."
VII	7.4	Irritating, cough.
VIII	7.0	Irritating.
IX	3.8	Well bearable, easily respirable.
X	4.8	Bearable.
XI	3.6	Without molestation.
XII	2.6	" "
XIII	4.4	Well bearable.
XIV	5.2	Well respirable.
XV	5.4	" "
XVI	5.8	Causing only little sensation.
XVII	6.2	Without much molestation, but with moderate irritation.
XVIII	6.4	Moderately irritating ; when breathed several times becomes molesting soon.

Hence the percentage of ether vapors to be breathed in a conscious state by the patient should not exceed 7 per cent., as even this concentration causes some irritation and cough. The reflex movement of cough is an unmistakable evidence that the vapors of the anæsthetic have reached the patient's lungs in too strong a concentration, and that in this way the lungs will be injured. When the patient by inhaling weaker concentrations of ether vapors has been made insensible, to such a degree at least as to show no more reflex action, this very state will favor the injurious effect of the stronger concentrations upon the lungs. As long as the patient is conscious, the reflex contraction of the glottis prevents the "irrespirable" gas or vapors from entering in the finest air passages. The physician who administers the narcotic should now take care that the lungs of the narcotized patient will not be injured. In order to obtain complete narcosis as soon as possible, it has been recommended to shake the fluid ether in the bag of the mask, whereby the concentration of ether vapors is increased to the maximum. Thus the physician himself produces these injurious concentrations instead of avoiding them. I believe that it is only by a shorter duration of such dangerous inhalations that the patients are prevented from suffering greater injury, so that they usually escape with slighter irritations of the bronchi.

The temperature of the air in the mask often amounting to 31° C. after having been breathed for one minute, favors the quicker evaporation of ether. Since none of the operators at Bonn make use of this model of Wanscher's mask for ether narcosis which I employed in the bromethyl narcosis and in my experiments upon healthy persons, I was obliged to perform a sort of artificial respiration by means of a bell-jar going up and down in warm water and propelling 500 cc. of the air into the mask to and fro. The border of the mask was closed by a caoutchouc membrane, a T tube of glass was put through the membrane, one branch of the T tube communicating with the bell-jar and the other with Hempel's burette. The temperature of the air varied in these experiments between 20° and 31° C. The percentage of ether vapors differed very much, as to the phase of respiration in which the gas proof was taken, whether the bag containing the fluid ether was shaken or not. The following table shows the percentage met with :

	Temp.	Vol. per ct. of ether vapors.	Remarks.
I	31.5°C	34.0	Strongly shaken.
II	19.2	6.2	Without shaking.
III	20.4	6.6	" "
IV	19.5	6.4	" "
V	19.8	6.8	" "
VI	19.8	7.0	" "
VII	20.4	28.6	Strongly shaken.
VIII	20.8	29.4	" "
IX	20.7	23.2	Moderately shaken.
X	21.4	31.2	Ether abundantly poured in, moderately shaken.
XI	21.8	27.8	Moderately shaken.
XII	21.4	28.4	" "
XIII	31.0	14.8	Without shaking.
XIV	31.0	15.7	" "
XV	26.0	7.4	" "
XVI	26.5	22.8	Shaken.
XVII	22.5	4.0	Without shaking ; taken at the end of exhalation.
XVIII	23.7	11.6	Moderately shaken ; taken at the end of an inhalation.
XIX	22.5	8.6	Without shaking, at the end of exhalation.
XX	22.3	18.4	Shaken ; taken at the end of inhalation.

The results of this table show that the percentage of ether vapors differed exceedingly ; the minimum was 4 per cent., the maxima were 34 per cent. and 31 per cent.; the latter exceeded the limit of 7 per cent., which could still be endured more than four times. It is impossible to regulate the quantity of ether vapor for the patient in exact proportions, and the estimation can only be made by analysis. By the kindness of Professor Fritsch, who tried the newest model of Wanscher's mask, recommended by Grossmann in some gynæcological operations, I had an opportunity to get 6 proofs of the air breathed by the patients. However, before proceeding I must mention that this newest model with its circular border placed on a straight place cannot fit the patient's face so well as the former mask, especially when it is very thin. This apparent defect proves to be salutary to the patient because it prohibits the danger of deficiency of oxygen. But even with that mask it is quite impossible to obtain a mixture of air and ether to be relied upon. The following analyses show that even when

the ether is only moderately shaken, the percentage of ether vapors very easily exceeds the irritating concentration of 7 per ct.

	Ether vapor. Per ct.	CO_2 Per ct.	O_2 Per ct.	
I	16.8	3.0	12.4	After 2 minutes, moderately shaken.
II	14.6	1.6	14.6	" 4 " lastly something shaken.
III	6.8	1.2	17.8	" ½ minute, without shaking.
IV	4.6	1.2	17.2	The mask rests upon the face very loosely.
V	10.8	1.8	16.8	Ether in the mask moderately shaken.
VI	12.8	0.9	14.4	Moderately shaken.

In a former paper * I have published the results obtained with Julliard's mask on surgical patients at Tübingen. This mask was either wrapped in a dry towel only, or it remained uncovered. The composition then found was much more gratifying than that met with in Wanscher's mask. Lately I have had an opportunity to get some analyses in the case of patients that were being narcotized with Julliard's mask, the capacity of which was something greater than that used on a former occasion; besides in all these cases the mask was wrapped in a *wet* towel, which is not so porous as a dry one. The following analyses show the effect of such modifications, which at first might appear quite unimportant:

	Ether vapor. Per ct.	CO_2 Per ct.	O_2 Per ct.	Operations.
I	13.8	1.8	14.0	Osteotomy (genu valgum).
II	9.6	1.6	15.8	Ektropium.
III	7.3	1.9	16.4	Extirpation of glands.
IV	3.6	2.4	17.2	" "
V	16.4	1.8	13.4	" "
VI	8.8	2.2	15.7	Ulcus cruris, transplantation.
VII	6.8	2.5	14.5	Amput. phalang. I digit. med.
VIII	10.6	1.8	15.4	Resectio genu.
IX	2.4	2.2	16.4	" " 25 minutes after pouring in.
X	13.6	1.7	14.9	" " " 10 " "
XI	6.6	1.4	17.0	" " " 5 " "
XII	7.3	1.9	16.2	" " " 1 minute " "
XIII	9.4	1.6	14.9	Ulcus cruris.
XIV	4.9	2.3	16.8	" " 5 minutes after pouring in.
XV	14.4	2.2	11.2	Scraping out a tubercul. phalanx.

The application of a wet towel produces a much higher percentage of ether vapors, *in maximo* 16.4 per cent.; however, this high percentage decreases soon after the ether has been poured in. But generally the percentage of ether vapors was shortly after this process still greater than 7 per cent., which is certainly too great for a conscious person as well as for further inhalation. After some struggling the narcosis was complete sooner than in the former manner. The average of carbonic was somewhat greater and that of oxygen less than I had found in my former researches on Julliard's mask without any towel. Nevertheless, even if a wet towel was wrapped round Julliard's mask and it had been lying for a long time (for instance 25 minutes) on the patient's face, the volumes of oxygen and carbonic acid are far less to be feared than those met with after one minute's breathing in the narcosis by bromide of ethyl with Wanscher's mask. The air in the latter

* Ueb. d. Zusammensetzung des bei der Aethernarkose geatmeten Luftgemenges. Beitr. z. klin. Chir., X., p. 412.

has been rapidly exhausted if the mask had been lying a longer time on the patient's face. In my later experiments with Julliard's mask the inner chamber was considerably larger than that of the model formerly used. The rapidity with which the air in the inner chamber of Julliard's mask is restored by the respiration of the patient depends upon the ratio existing between the volume of each inhalation (ca. 500 cc.) and that which the prominent part of the patient's head allows to remain in the inner chamber.

In order to determine this volume, the mask put under water was emptied into a measuring cylinder. The mask formerly used contained 1400 cc., the new one 2100 cc. The volume of the patient's head, surrounded by the border of the two models of the mask, was about the same. It was fixed in the following way: The border of the mask was marked on the skin of the face with an aniline pencil; then the person dipped her face up to the pencil-mark into a vessel previously filled with water up to its very brim; the displaced water caught in a salver gave the volume of the covered part of the head, amounting to 780 cc. Consequently the air remaining in the former mask was 1400 cc.—780 cc. $=$ 620 cc.; in the newer mask we had 2100 cc.—780 cc. $=$ 1320 cc. Every inhalation will restore 500 cc. in the inner chamber of the masks: in the former mask the patient has restored $\frac{500}{620}$ cc. $=$ 80 per cent. of the air by each breath; in the mask used latterly he restored but $\frac{500}{1320}$ cc. $=$ 37.8 per cent. The wet towel has the effect of increasing still these 1320 cc.

With one single exception the percentage of carbonic acid in the C_2H_5Br narcoses was never great enough to cause it to remain in the system. We know from the researches of Mr. G. Strasburg, made by means of the aëro-tonometer in the laboratory of Prof. Pflüger, that the carbonic acid in the venous blood of the heart has a partial pressure on an average 5.4 per cent. of the atmospheric pressure. The partial pressure of carbonic acid in the arterial blood is equal to only 2.8 per cent. of the atmosphere. In the experiments on narcotized patients the percentage of CO_2 met with was, as a rule, far below 5.4 per cent., which means that the discharge of carbonic acid from the blood into the air of the lungs is continually going on, although it is somewhat *protracted* in proportion with the diminished fall of partial pressure. In the experiments without narcotics the tension of carbonic acid frequently exceeds 5.4 per cent. after having been breathed for half a minute in Wanscher's mask; when working only for one minute even 8.9 per cent. CO_2 was found in one experiment. It is very likely that when the anæsthetic vapors are breathed the exhalation of carbonic acid is somewhat diminished in comparison with the normal state.

When Julliard's mask has no towel wrapped round, the percentage of carbonic acid was only 1.7–1.2 per cent. One per cent. of carbonic acid is not in[...] [...]ry [...]hing [...] the [...]t[...] [...] containing 1 per cent. of carbonic acid for several hours without injurious consequences.

Some authors assume the narcosis with Julliard's mask to be [illegible lines]

which are necessary to produce ether narcosis, and the time which would be required for an individual to produce the quantity of carbonic acid necessary to narcotize himself. The data for this simple calculation we find in a treatise of W. Müller,* published in 1858 under the direction of Prof. C. Ludwig. These experiments showed that carbonic acid administered in a proper dose acts as a narcotic poison, and that it is able to kill an animal in a comparatively short time. In order to produce narcosis in an animal it is necessary that the quantity of CO_2 which its body is to absorb amounts to the third part, and to produce death to half of its own volume (0.567–0.584). To calculate the time necessary for such an auto-intoxication, we must consider that a person lying quietly on the operating table will not produce more than 5 cc. CO_2 per kilogram of bodily weight in one minute. The volume of a kilo is about a liter $= 1000$ cc.; a kilo of man must therefore produce and retain the third part of 1000 cc.; the time required for producing these 333 cc. would be $\frac{333}{5} = 66.5$ minutes. During the few minutes in which an ether narcosis is complete it is impossible to accumulate a quantity of carbonic acid of any consequence, especially when the greater part of this gas has been exhaled, at least when using Julliard's mask.

In Friedländer and Herter's experiments,† the partial pressure of carbonic acid had to amount to at least 25 per cent. of

* Beiträge zur Theorie der Respiration. Sitzgsber. d. Wiener Akademie, 1858. XXXIII. Bd., p. 99.

†Ueber die Wirkung der Kohlensäure auf den thierischen Organismus von C. Friedländer u. E. Herter. Zeitschrift für physiolog. Chemie, II., 99.

atmosphere in order to produce in 1–2 hours a state of narcosis, but still quite insufficient for surgical purposes. The percentage of carbonic acid met with in my experiments, even on healthy persons, was *never high enough* to produce the slightest narcosis. On the contrary, according to the explanations of Prof. Miescher,* the lower percentages inhaled, as 3–12 per cent. of CO_2, strengthen the breathing movements; 10–12 per cent. cause decided dyspnœa with deep inhalations and active exhalations. Therefore the percentage of carbonic acid met with in the air of the masks cannot at all be looked upon as having a paralyzing or narcotizing effect.

By comparing the results of my former analysis with those given in the preceding pages it is obvious that among the methods of etherization used at present, the method of Julliard without any towel must as yet be considered the most favorable. The volume of air, which the covered part of the patient's head allows to remain in the inner chamber, should not exceed 600 cc.

The desirable end to be attained in narcotizing is to prepare and keep well-known proportions of ether vapor and air well regulated and constant; this is as important in the administering of anæsthetics as the prescribed doses of medicine taken internally. Just as the maximal dose of morphia and other strong acting drugs is fixed in the German pharmacopœia, so should the vapors of the volatile poisons, such as our anæsthetics (chloroform, ether, bromide of ethyl, etc.), not exceed a maximum percentage when they are administered.

* Bemerkungen zur Lehre von den Athembewegungen. Archiv für Anat. u. Physiologie, Physiolog. Abtheilg., 1885, p. 368.

CATHETERIZATION OF THE URETERS IN THE MALE.

By James Brown, M. D., *Assistant in Genito-Urinary Surgery.*

[Read before the Johns Hopkins Medical Society, December 17, 1894.]

Catheterism of the ureters, which has for some time past been so frequently resorted to in the female to determine the limits of disease in the upper urinary tract, will doubtless in the near future be as frequently practised in the male, since we hope to show you to-night it can now be done as readily in the latter as in the former. Since the method employed by us involves the use of the Nitze-Leiter cystoscope, a few words respecting the construction of this instrument may not be out of place.

In 1887 two instruments, constructed upon the same principle, made their appearance almost at the same time—one by Nitze, made by Hartwig of Berlin, and one from Leiter of Vienna; these two gentlemen, who had been associated in the construction of the platinum loop cystoscope of 1879, having quarreled and separated. We will first describe the Leiter instrument. This has the shape of a short beaked sound. Two forms are made: one, known as the anterior, for the examination of the anterior surface, vertex, neck and sides of the bladder; and one for the base and posterior surface, called the posterior cystoscope. They are alike in outward form, and

differ merely in the position of the light and the window. Each is composed of three parts—beak, shaft, and ocular end. The beak, which contains the small incandescent lamp, consists of a hollow metal hood with a long oval aperture covered in by a solid piece of rock crystal. This opening for the exit of the rays of light is placed on the anterior or posterior surface of the beak according to the kind of instrument. The hood can easily be screwed off and on to allow of access to the little lamp. The terminals of the lamp fit into two sockets, and are brought by means of insulated surfaces in direct communication with the battery. In the concavity of the elbow of the anterior instrument is placed a window prism, to refract the rays of light from the object looked at on to the end of the telescope. In the posterior instrument the window is at the convexity of the elbow, and is simply covered in by a plane glass window, as the object observed is in a direct line with the observer's eye. The shaft has two compartments; one serves for the reception of the telescope tube, and one, a very small tube, contains the insulated wire for connecting the lamp with the battery, the circuit being completed by the wall of the

instrument. The telescope tube, which extends from the ocular end to the elbow, is removable and can be used with either instrument. The ocular end has an arrangement for connecting the battery wires—a switch or key for opening and shutting the circuit, and a small knob on its rim which serves to indicate the position of the beak, and thus enables us to know what part of the bladder we have under examination. The only notable difference between the Leiter and Nitze cystoscopes is in the arrangement of the beak. In the Nitze instrument the tip of the beak is in the form of a hollow silver cap which is provided with a small oval aperture for the exit of the rays of light. The aperture is only covered in with the thin glass of the lamp, which is firmly cemented into the cap. Nitze claims that, owing to the great resistance of these small lamps when properly made, the pane of rock crystal is superfluous and has the disadvantage of obstructing the rays of light as well as of compelling us to use a smaller lamp.

In December, 1888, Dr. Brenner of Vienna had Leiter to place along the under surface of the shaft of the posterior cystoscope a small canula, whereby the fluid in the bladder could be changed without removing the cystoscope. This canula, which is 2 mm. in diameter and incorporated with the shaft of the instrument, terminates just below the window at the vesical end, while externally it is prolonged with a curve downwards separately from the shaft for a distance of several cm. Dr. Brenner afterwards attempted by passing a catheter through this canula to catheterize the ureters. He was successful in one female case, but failed in the male.

Others, it seems, made similar attempts. Thus Mr. E. Hurry Fenwick, in his excellent book on "The Electric Illumination of the Bladder and Urethra," in speaking of this instrument, gives his opinion upon it as follows: "I have had Brenner's pattern, and I believe Mr. Harrison has also used it; it has been returned by both of us as unpractical. As regards its adaptability for catheterization of the ureters *of the female* I have nothing against it. The orifices of the ureters will be rarely found, however, so patulous or so well placed as to allow of such a proceeding being accomplished by means of this instrument."

Now it is this same instrument we employ and find little or no difficulty in catheterizing the ureters in the male or female. So far we have not a single failure to record.

Respecting the mode of its performance this is very simple. With the bladder containing if possible from 150 to 200, or even as much as 300 cc. of fluid (for the amount that will cause the ureteral orifices to present most favorably varies in different cases), we pass the anterior cystoscope and take a complete survey of the bladder. This done, we replace it with the Brenner instrument, which is passed with its stylet in. The ureteral orifices are searched for; these being found, the stylet is removed, catheter inserted and passed nearly to the inner opening of the canula, ureteral orifice is again found and the catheter is passed into it. To prevent kinking of the catheter and to guard against exerting undue traction upon the ureteral orifice, the cystoscope must be kept in line with the catheter as long as the latter is within the ureter. Not infrequently we have found it of great advantage to give the catheter a slight curve at its tip. Such a curve enables us, by rotating

the part of the catheter external to the bladder between the thumb and finger, to vary the direction of its tip in the bladder. If a small wire, to which has previously been given the desired curve slightly exaggerated, be passed into and left in the catheter when not in use, it will be found that the curve thus given the tip of the catheter will be retained when the wire is withdrawn. This is always done before introducing the catheter into the canula. Not infrequently this little manœuvre has enabled us to overcome the faulty presentation of the ureteral orifice of which Mr. Fenwick speaks.

In considering the advisability of an operation upon one of the kidneys and the kind of operation that had best be performed, if any, one would be largely influenced in his decision by the conclusion he arrived at respecting the second kidney. As one would not think of performing nephrectomy in bilateral suppurative or tubercular disease, so one would not remove a kidney, even though the seat of a neoplasm, if he was convinced either that it was the only kidney or of the incapacity of its fellow to carry on the necessary renal function. It has been generally recognized by surgeons that the best possible way to determine the condition of the second kidney would be to collect its secretion unmixed with that of its diseased companion. While in the female, thanks to the efforts of Pawlik, Simon, Kelly and others, catheterization of the ureters is generally recognized as the only means of reaching this end with any degree of certainty; in the male, prior to the introduction of Brenner's modification of the Nitze-Leiter cystoscope, such a procedure had been so commonly regarded as impracticable that almost no effort had been made in this direction. The various methods proposed for compressing one ureter and thereby obtaining the unmixed secretion of the opposite side have not been reliable in their results.

The brief histories of the following three cases serve to illustrate both the value of catheterization of the ureters as a diagnostic means and the class of cases to which it is applicable.

Case 1.—Mr. T. was a patient in this hospital under the care of Dr. Osler and was referred to us last May for catheterization of the ureters. He was 19 years old and gave a history of frequent and at times severe paroxysms of pain in the right loin, dating back four years. The first attack followed two days after falling against a bar, striking upon his right side. It continued for two days and then disappeared, leaving him free for a month. He then had a second attack of a similar character. The pain was sometimes behind, sometimes in front, but never radiated downwards. As time went on the attacks became more and more frequent and occasionally were attended by nausea and vomiting. The urine was reduced in amount and occasions to be bloody. In 1892 he contracted syphilis and gonorrhœa. On May 12, 1894, both ureters were catheterized and from 4 to 4 oz. of urine obtained from each. The specimen from the right side was cloudy and the microscope showed it to contain numerous polynuclear leucocytes. That from the left was also cloudy, but it became perfectly clear on the addition of a minute quantity of acetic acid. Microscopically it was found to contain a considerable quantity of white blood-cells, doubtless attributable to the catheter. He was transferred from the medical to the surgical side, and an

May 23d the right kidney was removed by Dr. Halsted. A stone was found occupying one of the infundibula. After recovering from the operation, the urine, except for the presence of a few threads in the first glass, the remnant of the attack of gonorrhœa, was found to be perfectly normal.

Case 2 was a gentleman from St. Louis, brought to me, September 19, 1894, by Dr. Black, of that city. Mr. S., married, æt. 62. His history is as follows: In 1873, after lifting a heavy weight, he was seized with a severe pain in the left renal region. It came on suddenly, and after lasting a day or two it gradually disappeared. It was seated just below the false ribs and radiated downwards to the testicle, penis and thigh. It was accompanied by nausea, vomiting and diarrhœa and a frequent desire to micturate, the urine being bloody. A few weeks subsequently he had a second attack, but on this occasion the pain was suddenly relieved, a small flattened calculus the size of a large pea being soon afterwards discharged. Subsequently he had two other attacks, one in 1875 and one in 1886. From this time on up to six months ago he had suffered from a constant dull pain in the left renal region and numbness of the corresponding thigh. At times he would experience sharp cutting pains in the left loin, but these would last only a few minutes. Violent or sudden movements he instinctively avoided. Up to five weeks ago he had been almost entirely free from pain, and says that he felt better than he ever had since his first attack. All along his general health has been good, his weight averaging 171 pounds.

Status præsens.—Complexion sallow, well nourished; weight 171 pounds, height 5 feet 11 inches, micturition normal, suffers from a constant dull pain in the left loin, together with a feeling of numbness along the outer part of the left thigh. Appetite is moderately good, tongue clean and moist and bowels regular, heart and lungs normal, arteries soft and corneæ clear. Neither kidney is palpable. Pressure over left kidney elicits pain more marked behind than in front. Pressure along the corresponding ureter is also painful, especially at the point where it crosses the brim of the pelvis. No pain on pressure over corresponding points of the opposite side, nor in the hypogastrium. Both testicles were found hard and atrophied, and over each there was a depressed scar. Meatus small, 20 F., while a stricture was found 3 inches long in the pendulous urethra, commencing one-half inch from the orifice. The meatus being cut up to 29 F., and the stricture not admitting of the passage of the cystoscope, gradual dilatation of the stricture was advised to be practised until a 29 F. sound could be passed into the bladder. A specimen of urine which the patient had just passed previous to visit was of normal color, acid reaction, specific gravity 1021, and slightly opaque, a small amount of yellowish sediment being deposited on standing. It contained no sugar, but was highly albuminous. The microscope showed the sediment to consist of pus and epithelial cells, the latter of various shapes, together with hyaline and granular casts. In the early part of November Dr. Black returned with his patient, stating that the stricture had readily yielded to the dilatation and a 29 F. sound could be easily introduced. On the 21st of November, with the patient under chloroform, after having made several fruitless attempts without general anæsthesia, both ureters were readily cathe-

terized and several cc. of urine obtained, the catheter being passed several inches up the canal. These specimens, together with a specimen of the mixed urine, were submitted for examination to Dr. Lewellys F. Barker, at the Anatomical Laboratory, who kindly wrote out the following report:

Report on specimens of urine sent by Dr. Brown, November 21, 1894, Mr. S.

The *mixed urine* is of a pale straw color, turbid, and deposits on standing a whitish, flocculent but not abundant sediment; contains a small amount of albumen, no sugar, no bile; yields no diazo-reaction of Ehrlich; on microscopic examination there are a few hyaline and finely granular casts, a number of pus corpuscles with polymorphous nuclei, a few small mononuclear cells, numerous squamous epithelial cells, and also red blood corpuscles to be seen. The specific gravity is 1012. The reaction of the urine is acid.

The *urine from the left ureter* also contains a few granular and hyaline casts, red blood corpuscles, epithelial cells and many pus corpuscles. It contains a small quantity of albumen, but very much more than an equal quantity of the specimen of mixed urine from the bladder. Octahedra of calcium oxalate are visible.

The *urine from the right ureter*. This urine contains only a faint trace of albumen, much less even than the specimen of urine from the bladder, and very much less than the urine from the left ureter. Microscopically, a few granular and hyaline casts are present, also a few red blood corpuscles and flat and tailed epithelial cells. Only an occasional leucocyte can be made out.

In view of the results of this examination, showing clearly the presence of chronic nephritis on the right side, a condition admittedly rendering any operation extremely hazardous, together with the fact that the patient, though engaged in active business, suffered no severe pain while using ordinary care, a policy of non-interference with the left kidney, which was evidently the seat of stone, was advised.

Case 3.—Mr. H., æt. 30, was seen in consultation with Dr. N. R. Gorter, of this city, in regard to the advisability of catheterizing the ureters. The abdomen was the seat of an enormous tumor, the swelling, whose limits could be easily defined, extending from the margin of the ribs on the right side to within a finger's-breadth of Poupart's ligaments, two fingers'-breadth below umbilicus in the median line, five fingers'-breadth to the left and two fingers'-breadth above the umbilicus in the median line. Its borders were smooth and rounded. On deep expiration a muffled tympanitic note could be elicited between liver and tumor; dullness just below the margin of the ribs. Behind, the dullness extended to the spine; the area of tumor dullness was not materially changed by position. There had been no history of a sudden diminution of the swelling with the discharge of a large quantity of urine. The patient first noticed the swelling two years ago, since which time it has been gradually increasing in size. The urine, which was of an acid reaction, contained a considerable amount of pus. It had been examined for tubercule bacilli, but with negative results. The family history was unimportant. The patient's general condition was poor, his limbs wasted, skin sallow, appetite poor, intellect dull; over the swelling the subcutaneous veins were considerably dilated.

On November 19th both ureters were easily catheterized under chloroform and several cc. of urine collected from each. The following is Dr. Barker's report of the examination of these specimens:

Specimen No. 1, *from the left ureter* (Mr. H.)– The urine is of a pale straw color and shows a slight whitish sediment. It contains albumen, though in very small quantity. Microscopically, a few leucocytes with polymorphous nuclei, and a few squamous epithelial cells are found to be present in the sediment. The epithelial cells look fresh, and five or six of them are seen occasionally together.

Specimen No. 2, *from the right ureter.*—The urine is yellowish in color, turbid, and yields considerable sediment on standing. It gives a copious precipitate of coagulated albumen on boiling, though not enough to render the urine solid. Still, there are many times as much albumen in this specimen as in specimen No. 1. On microscopic examination the sediment is found to consist largely of pus cells with polymorphous nuclei. There are also many small mononuclear cells, epithelial cells and red blood corpuscles present.

PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS HOSPITAL MEDICAL SOCIETY.

Meeting of December 17, 1894.

DR. J. J. ABEL in the Chair.

The Visual Field as a Factor in General Diagnosis. DR. DE SCHWEINITZ.

After a description of the normal visual field for form and color; the different characteristics of the results of perimetric measurements obtained when the patient is standing, sitting, or reclining; the phenomena of adaptation of the retina and the changes which varying degrees of illumination produce in the field of vision; the area between the point upon the perimetric semicircle at which a color is recognized as such, and the point where the object is first seen coming in from the periphery (Hering's zone), and the extent of the color field according to the size, saturation and intensity of the test object, Dr. de Schweinitz divided his subject into:

1. The value of the visual field as a means of differentiating between organic and so-called functional affections of the nervous system, particularly hysteria.

In this connection particular attention was directed to the phenomena of *reversal of the color lines;* the possibilities of the hysteric visual field, according to the studies of Dr. de Schweinitz and Dr. John K. Mitchell, being

(*a*) Simple contraction of the color fields with unaffected form fields.

(*b*) Contraction of both form and color fields, the green field being relatively more contracted than the others.

(*c*) Partial or complete reversal of the normal sequence in which the colors are appreciated, most commonly that variety in which the red field is greatest in extent. Under these circumstances the color fields may be normal in size, sometimes even wider than normal, or there may be an associated contraction of all the color fields.

(*d*) Unusual obscurations of the visual field, for example, in the form of hemianopsia, or greater contraction of the fields on one side than on the other, the greater contraction usually being found on the same side with the anæsthesia.*

The practical application of these facts was illustrated by the clinical histories of cases and an exhibition of characteristic maps of the visual-field-alterations.

The value of this method of examination was urged in the study of the implantation of hysteria on an organic lesion, *e. g.*

spastic paraplegia of organic origin and hysteria, or of toxic hysteria, *e. g.* hysterical lead paralysis, and was especially commended in the differential diagnosis between true hysteria and so-called hysterical insular sclerosis.*

Finally, the diagnostic import of disturbance of the color-sense in the difficult distinction between certain types of neurasthenic and hysteric patients was pointed out.†

2. The value of the visual field in the localization of intracranial lesions, with special reference to hemianopsia, and the representation of certain retinal areas in the cerebral cortex.

Dr. de Schweinitz rapidly sketched the visual pathway from the peripheral percipient elements in the retina to the cortex of the occipital lobe, and described the results upon the visual field of lesions variously placed in its course, especially referring to the different varieties of hemianopsia and the value of the hemiopic pupillary inaction sign as a differential diagnostic point between lesions anterior and posterior to the primary optic centres.

Hemianopsia of the homonymous variety without pupillary defects, and the localizing value of this phenomenon associated with other symptoms, for example, aphasia, hemiplegia, hemianæsthesia, etc., was briefly discussed, the following features connected with hemianopsia being especially dwelt upon:

(1) Certain hemianopsias indicate that there is a correlation between the parts of the retina and the occipital lobe, and that the removal or destruction of certain portions of the occipital lobe result in loss of certain portions of the visual field.

(2) The probable existence of a centre for the macula lutea in the occipital lobe was described, and the description illustrated by a case of double hemianopsia studied by the author in connection with Dr. Dunn, of West Chester, in which a small central portion of the field of vision surrounding the fixing point remained unaffected.

(3) It was pointed out that the facts just related and illustrated with diagrams indicated that a lesion of this macular centre would manifest itself in the form of a central scotoma, and was explained a more occult condition in fields, and more thoughtful consideration of certain scotomas for which no real cause could be found in the optic nerve itself.

(4) The sense of sight being composed of color, form and light, it was pointed out how the evidence indicated that these

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*Consult : A Further Study of Hysterical Cases and their Fields of Vision. By John K. Mitchell, M. D., and G. E. de Schweinitz, M. D. Journal of Nervous and Mental Diseases, January, 1894.

* Consult Bernard. Medick Medical Journal [illegible]
† Consult [illegible]
l. v. Frank, [illegible] Alient [illegible]
heilkunze, XI Heft [illegible], and Mitchell and de Schweinitz [illegible]

centres were situated in the cortex of the occipital lobe, or perhaps the posterior end of the occipito-temporal convolution, and from a relative hemianopsia, that is one, for example, in which the light-sense was preserved, but either the form-sense or the color-sense was wanting, could only result from a cortical lesion.

The subject of *hemiachromatopsia* was illustrated by the description of two cases clinically observed, probably the result of disease of the occipital cortex affecting only the centre for color; although the case of Samelsohn was referred to, in which a glioma-sarcoma pressing upon the optic tract, optic thalamus and corpora quadrigemina was associated with this symptom.

(5) The lecturer called attention to the fact that hemianopsia, although usually a direct symptom, may sometimes be an indirect sign of disease, as the result of what the Germans called *fernwirkung*, which Mr. Swanzy has translated into "distant symptom."

(6) Finally, it was pointed out that hemianopsia may accurately localize a lesion within the cranium when that lesion is itself insignificant and unimportant, the main and essential disease being quiescent. This point was illustrated by the description of a case of large tumor occupying the second and third temporal, and encroaching upon the fourth convolution, which gave no localizing sign of its presence, while a lesion in the cuneal region (a small cyst) was inferred from the study of the case, chiefly the visual phenomena, and laid bare by the surgeon's trephine.*

Catheterization of the Ureters in the Male.—DR. BROWN. [See page 12.]

DR. WELCH.—I should like to have been able to discuss Dr. de Schweinitz's paper. I can only say that I have been fascinated by it. It will make a good many of us go home and read about this subject, and that is a sign of a good paper.

A word with reference to Dr. Brown's important communication. It is important as illustrating the practical value of the application of this procedure. I recall a case in New York in which I made an autopsy—a case in which a serious mistake was made which would have been avoided had this method of determining the presence or absence of the kidneys been used. The patient was a vigorous young German girl who had atresia of the vagina. An effort had been made to reach the uterus by cutting through this closed vagina. They opened the canal up to a certain distance and then abandoned the attempt. Then they found a mythical tumor on the left side. Various diagnoses were made as to the nature of that tumor. The prevailing opinion was that it was connected with the left ovary, and, indeed, that was the opinion of one of the most distinguished surgeons of New York. Dr. Lusk, who saw the case, made a correct diagnosis of movable kidney. The case was operated upon before the class at Bellevue Hospital and the kidney removed. There was nothing the matter with the kidney other than that it was movable. The kidney was brought at once over to my laboratory. It was a very large,

* The case is fully described by Dr. H. C. Wood, under whose care the patient was, in the University Medical Magazine, Volume 1, page 383.

succulent kidney. I happened to have made an autopsy a few days before on a man who had only one kidney, and the appearance of the kidney was impressed upon my mind; the thick cortex and the beautiful markings of the cortex, the normal structure greatly exaggerated but perfectly healthy. This kidney looked so much like the one just mentioned that I surmised at once that it was the only kidney the patient had and suggested that, to the horror of the surgeon. The patient lived eleven or thirteen days, voiding no urine. For seven or eight days there were no symptoms to occasion alarm. During the last forty-eight hours uræmic symptoms manifested themselves and the patient died. The autopsy showed that the patient had but one kidney and that had been removed by the surgeon. The operator was very frank in bringing the case to the notice of the medical profession and published it in all its details in one of the medical journals in 1881 or 1882. He discussed at that time all the methods that his ingenuity could suggest as to the possibility of recognizing the presence of a second kidney. I do not know that he at that time even thought of the possibility of catheterizing the ureter. I remember that he discussed the advisability of pressing on the ureter on one side and determining in that way whether the other was present. This is simply one case which shows that there is a practical use for this procedure.

NOTES ON NEW BOOKS.

Napoleone ; una Pagina Storico-Psicologica del Genio. By DR. A. TEBALDI, Professor of Psychiatry, University of Padua. (*Padova*, 1895.)

In this historico-psychological study of Napoleon, Dr. Tebaldi has given the medical profession a most valuable and interesting contribution to Napoleonic literature. The material for the study has been mainly drawn from the previous works of Thiers, Taine, La Bourienne, Yung, Metternich, Levy, Baron de Meneval, Autommarchi, Lombroso, and the correspondence of Napoleon.

The point of view of the work is stated in the preface, and closely adhered to in the body of the text: " It is not my purpose to pass judgment on the leader, the statesman or the legislator (for which indeed I feel myself incompetent), but I shall seek only the man, having as foundation for my study the examination of his physical development and inherited tendencies to bear out a psychological law."

The brochure is divided into five parts: Napoleon's Ancestry, Physical Development, Intellect, Personality, and Character, and each theme is treated lucidly and impartially. After these comes a *resumé* of the conclusions reached, which is in some measure the most interesting part of this instructive book.

In the chapter on Physical Development, the question as to Napoleon's being an epileptic is fully discussed, and the writer decides that " the physical examination of Napoleon shows him to be an undoubtedly neurotic individual, not improbably of an epileptic character, and with a constitution which rendered him liable to degenerative diseases, foreshadowing a brief course of life, owing to his hereditary predisposition to cancer."

The study on Intellect emphasizes strongly Napoleon's marvelous rapidity of conception and execution, his absolutely independent judgment, his wonderful power of passing immediately from one difficult subject to another, and gives his own explanation of this ability, when, having compared his brain to a combination of little chests, he says, " When I leave one subject I close that box, to open another if anything else has to be considered." It mentions

his apparently endless endurance, his power of protracted concentration of thought, and while frankly admitting his ignorance of arts and sciences, adds : "In comparison with the warrior, it is true that the man of culture and the legislator dwindles, but it seems to me that some have tried to belittle him too much. It would be absurd to regard Napoleon as a litterateur or a scientist, but to my mind it is incorrect to think that his culture was unequal to the qualities of a great leader."

In treating of Napoleon's Personality full justice is done to his excellence as son and brother, to his frequent generosity to his personal enemies, to his correct views of law and order (for others), to his affection for Josephine ; while his impatience of personal restraint, his intense egotism, his absolutely elastic conscience, and his unapproachability as an equal, are frankly admitted.

The tracing by the writer of the change in his character from the First Consul, "pensive, polite, prudent in speech and serious in action"; to General, "enthusiastic, ardent, with ' La Patrie ' on his lips and love in his heart"; and then to Emperor, a man "grown stouter in body and stiffer in mind, cold, proud, preoccupied with ceremonies and etiquette," is excellent.

Some of the salient points in the study on Character are his firmness of will and promptness of action, which are shown to have involved him in troubles more than once when a subordinate officer. His intense capability for anger, of which Thiers says that the flashes thereof "when real lasted but a second, when feigned, as long as needful," and above all, his power to inspire his soldiers with such intense love for himself that as one man they were ready to do and dare whatever he ordered, are forcibly brought out. His alleged superstition is treated as a " pose " whereby he was enabled to mould more to his liking his subjects' opinions with regard to his own destiny.

The analysis of the entire subject throughout the brochure is keen and unprejudiced, the style markedly clear and direct, the author always going straight to the point, and the amount of information and compact reasoning he has succeeded in condensing into the one hundred and sixty pages of the work is unusual.   G. H. S.

A Monograph on Diseases of the Breast. By W. Roger Williams. (*John Bale & Sons*, 87 *Great Litchfield St., London.* 1894.)

Mr. Williams, very wisely we think, begins his work on diseases of the breast with a short but clear and concise account of the ontogeny and phylogeny of the mammary gland. The history of the development of the gland in the human being and in the lower mammalia is not only interesting, but gives much aid in understanding the various congenital defects and anomalies in the gland. The second chapter on the morphology of the gland and its secretory functions is generally satisfactory. The author draws attention in this chapter to the common error of supposing that the gland is circular ; he points out that it really has a tricuspid form, and that in the ordinary operation for the removal of the breast, the apices of the cusps are nearly always left behind to orignate anew the disease.

The third and fourth chapters deal with mammary variations from defect, and with supernumerary mammary structures ; the account of these latter is especially full and clear. Chapter five deals with the various forms of mammary hypertrophy ; the subject is well classified and ably handled. The chapter on histology and neoplastic pathogeny is very satisfactory. One point is noticeable in reading this chapter, and this is that our knowledge of the nerve supply of the breast could be considerably extended.

Chapter seven is a statistical one, dealing with the varieties of mammary neoplasms and their relative frequency. The chapter brings out the interesting fact that whilst the relative liability of the female breast to malignant disease is above the average, its liability to non-malignant neoplasms is considerably below the average.

In the chapter on the parasitic theory of cancer we are glad to see

that the author discountenances protozoa as a cause of the disease. Most of the prominent pathologists, we think, are now inclined to regard the so-called protozoa as the products of endogenous cell formation. The author states his belief in the non-contagiousness of cancer in this chapter, regarding the apparent cases as merely remarkable coincidences. Chapters eleven to seventeen are taken up with the study of mammary cancer, the term cancer being restricted to neoplasms of epithelial origin.

The chapters on the general morphology and general pathology of the disease are excellent.

The chapter on the operative treatment is not so satisfactory. While the author recommends a fairly radical operation, we cannot agree with him that the mere skinning off the fascia of the great pectoral muscle is sufficient in most cases. Whilst the well known researches of Heidenhain and others have shown that in most cases the progress of the disease is arrested for some time by the pectoral fascia, yet actual results have shown that entire removal of at least the sternal part of the pectoralis major has resulted more favorably to the patient.

In the chapter on the pathology of breast cancer we are glad to see that Mr. Williams has separated so sharply the intra-canalicular fibroma, a non-malignant disease, from the tubular form of cancer, which is malignant ; the two are usually confounded.

In the chapter on cancer of the male breast one is struck with the fact that the disease is much more frequent than one would suppose from reading most text-books. According to the author, carcinoma occurs in the male breast once where it occurs in the female 99 times.

Chapters 17 to 23 take up sarcoma and non-malignant tumors. These chapters show the same care and systematic arrangement as those on cancer.

The closing chapters on mastitis, tubercle and syphilis of the breast are highly satisfactory.

Taking the work as a whole, one is impressed with the extremely systematic manner in which it has been arranged. The language is clear and forcible, and the references are profuse and culled from the best sources. The book is well printed upon good paper.

We would recommend Mr. Williams' work to any one who wishes to acquire a clear understanding of diseases of the breast without wasting unnecessary time on superfluous theories.

BOOKS RECEIVED.

A *Manual of Organic Materia Medica and Pharmacognosy*. An Introduction to the study of the vegetable kingdom and the vegetable and animal drugs, etc. By L. E. Sayre. With 543 illustrations. 1895. 8vo, 555 pages. P. Blakiston, Son & Co., Philadelphia.

On Chronic and Chorea Affections. By William Osler, M. D. 1894. 125 pages. P. Blakiston, Son & Co., Philadelphia.

Saint Thomas's Hospital Reports. Edited by Dr. T. D. Acland and Mr. B. Pitts. New Series, vol. xxii. 8vo. 1894. J. & A. Churchill, London.

Real Encyclopädie der gesammten Heilkunde. Medicinisch-chirurgisches Handwörterbuch für praktische Ärzte. By Prof. Dr. Albert Eulenberg. Third thoroughly revised edition. Vol. iv. Urban & Schwarzenberg, Vienna and Leipsic.

Transactions of the Congress of American Physicians and Surgeons. Third Triennial Session held at Washington, D. C., May 29, 30, 31, June 1, 1894. Published by the Congress. New Haven, Conn.

Progrès de Thérapeutique. Archives Internationales de Thérapeutique générale et appliquée. By G. Apostoli. Office Samuel d'Éditions Scientifiques, Paris.

Logic and Art. The Annual Address read before the Philosophical Society of Washington, December 12, 1894. By Lester F. Fletcher, M. D. 1895. Judd & Detweiler, Washington.

On General Paralysis, with a critical digest. By W. Julius Mickle, M. D., F. R. C. P. (London), Grove Hall Asylum, London. Reprint from Brain. 1894. Macmillan & Co., London.

Practical Suggestions respecting the Ventilation of Buildings. By John H. Kellogg, M. D. Reprinted from the 19th Annual Report of the Michigan State Board of Health. 1891. Lansing, Mich.

The Relation of Static Disturbances of the Abdominal Viscera to the Displacements of the Pelvic Organs. By John H. Kellogg, M. D. Reprinted from the Proceedings of the International Periodical Congress of Gynecology and Obstetrics. 1894. Modern Medicine Publishing Company, Battle Creek, Mich.

The Rain Bath at the Utica State Hospital. By Wm. Paul Gerhard, C. E. 1894. Republished from the Engineering Record. Privately printed by the Author. New York.

Traumatic Paralysis of the Abducens Nerve. By Dr. O. Purtscher, of Klangenfurt. Translated by Dr. Harry Friedenwald, of Baltimore. Reprinted from the Archives of Ophthalmology. 1894.

Traumatic Paralysis of the Abducens Nerve. By Dr. Harry Friedenwald, of Baltimore. Reprinted from the Archives of Ophthalmology. 1894.

The Effects of Various Metals on the Growth of Certain Bacteria. Read before the Association of American Physicians, May 30, 1894. By Meade Bolton, M. D., Johns Hopkins University. Reprinted from the International Medical Magazine for December, 1894.

Annali dell' Istituto d'Igieni Sperimentale della R. Università di Roma. Edited by Prof. Angelo Celli. Vol. iv., Fasciculi 2 and 3. 1894. Ermanus Loescher & Co., Rome.

Bulletino della Reale Accademia Medica di Roma. Edited by Prof. G. Colasanti and Prof. G. Sergi. 1894. Tipografia Innocenzo Artero Rome.

CLIMATOLOGY AND PUBLIC HEALTH.

The following announcement is made by the U. S. Weather Bureau.

Washington, D. C., January 2, 1895.

The interest manifested by every class of people in the subject of climate and its influence on health and disease has determined the Honorable the Secretary of Agriculture, through the medium of the Weather Bureau, to undertake the systematic investigation of the subject.

It is hoped to make the proposed investigation of interest and value to all, but especially to the medical and sanitary professions, and to the large number of persons who seek, by visitation of health resorts and change of climate, either to restore health or prolong lives incurably affected or to ward off threatened disease.

The study of the climates of the country in connection with the indigenous diseases should be of material service to every community, in showing to what degree local climatic peculiarities may favor or combat the development of the different diseases, and by suggesting, in many instances, supplementary sanitary precautions ; also by indicating to what parts of the country invalids and health-seekers may be sent to find climatic surroundings best adapted to the alleviation or cure of their particular cases.

The hearty co-operation of the various boards of health, public sanitary authorities, sanitary associations and societies, and of physicians who may feel an interest in the work, is asked to achieve and perfect the aims of this investigation.

No compensation can be offered for this co-operation other than to send, free of cost, the publications of the Bureau bearing upon the climatology and its relation to health and disease, to all those who aid in the work.

Co-operation will consist in sending to this office reports of vital statistics from the various localities. That these reports may be of value, it is evident to all that they should be accurate and complete, and be rendered promptly and regularly. Blank forms of reports have been prepared so as to occasion as little trouble and labor as possible on the part of the reporter, and will be furnished by the Bureau on application.

At the very beginning of the investigation it is not possible to

outline precisely the channels through which the results obtained will be made public, but it is hoped to publish soon a periodical devoted to climatology and its relations to health and disease. The publication will probably resemble in size and general appearance the present Monthly Weather Review, the subject-matter being, of course, different.

More detailed information will be furnished on application.

MARK W. HARRINGTON, *Chief of Bureau.*

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      Price $1.50.

Report in Surgery, II.

The Results of Operations for the Cure of Cancer of the Breast, performed at the Johns Hopkins Hospital from June, 1889, to January, 1894. By WM. HALSTED, M. D. Price $1.00.

Report in Gynecology, III (in press).
By T. S. CULLEN, M. B.

I.   Hydrosalpinx, its Surgical and Pathological Aspects, with a report of twenty-seven cases.
II.   Post-operative Septic Peritonitis.

Report in Dermatology, I.

Containing Protozoic Dermatitis, Molluscum Fibrosum, Urticaria, etc. By T. C. GILCHRIST, M. R. C. S. (To appear in January.)
Price of Volume IV complete, bound in cloth, $5.00.

Volume V.

Nos. 1, 2, 3.—Report on Malaria. By WM. OSLER, M. D. ; W. S. THAYER, M. D.; J. HEWETSON, M. D. ; L. F. BARKER, M. B. (To appear in February.)

THE JOHNS HOPKINS HOSPITAL BULLETIN, VOLUME VI.

The BULLETIN of the Johns Hopkins Hospital enters upon its sixth volume, January 1, 1895. It will contain original communications relating to medical, surgical and gynecological topics reports of dispensary practice, reports from the pathological, anatomical, physiological-chemical, pharmacological and clinical laboratories, abstracts of papers read before, and of discussions in the various societies connected with the Hospital, reports of lectures and other matters of general interest in the work of the Johns Hopkins Hospital and the Johns Hopkins Medical School.

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BULLETIN

OF

THE JOHNS HOPKINS HOSPITAL.

CONTENTS.

GONORRHŒAL PYELITIS AND PYO-URETER CURED BY IRRIGATION.

BY HOWARD A. KELLY, M. D.

[Read before the Johns Hopkins Medical Society.]

In the case of which I shall give a detailed account in this article, I have been able to realize one of the important benefits attainable by my new method of examining the female bladder and ureters (*v.* Johns Hopkins Hospital Bulletin, Nov. 1893, and Amer. Jour. Med. Sciences, Jan. 1894).

The patient came to me with an extensive accumulation of pus in the left ureter, extending up into the pelvis of the kidney. This was caused by a stricture of the vesical end of the ureter with a dilatation above it, associated with a gonorrhœal infection.

I treated the stricture by dilating it with a series of ureteral catheters, increasing in diameter from 2 mm. up to 5 mm.

After drawing off the purulent fluid, the ureter and pelvis of the kidney were washed out with medicated solutions. The calibre of the stricture was enlarged, reducing the quantity of the accumulation above it from 150 to 100 cc. The purulent character of the secretion was removed and all trace of gonococci disappeared.

My patient was sent to me by Dr. Stark, of Cincinnati, O. She was a married woman, slight, somewhat haggard looking, thirty-one years of age. She had one child four years ago, without any special difficulty, her only pregnancy in six years

of married life. The menses were regular and without pain. Headaches were rare ; the appetite was good and the bowels regular.

She was feeling depressed and had lost weight, and complained of a severe pain on urinating, persisting for about a half-hour afterwards. She had also a sense of pressure in the bladder, and was obliged to urinate every two to three hours. The trouble was especially distressing at night. She had no acute pain, but an aching in the limbs, and lower abdominal discomfort. The appearance of the urine as noticed by her varied greatly, being clear at times, and at other times containing much yellow sediment.

My examination showed that the vaginal orifice was set far back near the anus, but was well lifted up under the symphysis by an intact levator ani. The cervix was in the axis of the vagina somewhat low down. [...] the uterus was in retroflexion. There was no marked tenderness of the uterus, the left ovary was displaced downward and tender on pressure, but not adherent. On examining the anterior wall of the vagina no special tenderness was developed on palpating the bladder.

distinctly felt to be harder than normal and somewhat thickened, but without marked tenderness. The left ureter also showed a displacement towards the pelvic floor.

The bladder was examined under atmospheric dilatation with the patient in the knee-chest position, through the No. 10 speculum. There were abundant evidences of a patchy, mild grade of cystitis. The field opposite the ureter, the posterior pole, and its surrounding area were of a mottled red, injected appearance, the vessels being entirely obscured; this injection increased towards the vault, where no normal background appeared. The vault over an area 4x5 cm. was covered by fine granules, averaging one or two to the square millimeter, most marked on the right side. The tips of each of these granules reflected the light and gave the surface a bright studded appearance. On the left side in places the surface presented a superficial worm-eaten appearance. On the right lateral wall 2½ cm. behind the ureteral orifice was a ridge 2 mm. in height, extending downwards to the base of the bladder. Near the right ureteral orifice was an area of intense congestion presenting an œdematous appearance, surrounding the ureter, whose orifice could only be located by a little pallor in the form of a crescent.

Posterior to the right ureter was a superficial ulcer 2x3 mm., with a narrow red border and a yellow centre.

The left ureteral orifice was situated on a truncate cone about 6 mm. in diameter at its base and 2 mm. at the top. It was slightly œdematous, and on the urethral side broken up by a number of irregular papillary eminences. The site of the ureteral orifice at the first examination was marked by a yellow spot of pus. On introducing a searcher into the opening of the orifice, a thin stream of pus escaped and ran down over the bladder wall.

Upon leaving the ureteral catheter in the left ureter for three minutes, 11 cc. of dark fluid escaped, followed by 6 cc. of fluid containing pus. In the twenty-four hours following the examination the patient passed 700 cc. of urine.

During the whole time the patient was under treatment, lasting from the 1st of March to the 4th of August, 1894, I catheterized her left ureter about 120 times in all. The first three weeks of her stay were passed in vain endeavors on my part to get the ureteral catheter well into the ureter. Three difficulties prevented this at first. In the first place the irregular papillary prominences on the left side in the neighborhood of the ureteral orifices obscured it and made it impossible to locate it with certainty, after the first examination in which the pus was seen in it as stated; in the second place the location of the orifice was unusual, lying extremely displaced to the left; in the third place there was a spiral stricture of the intravesical portion of the ureter, and it was necessary for me to learn the twist of the stricture before I could pass the catheter at once at every sitting. I cannot say too much in praise of the tenacity and pluck of my patient throughout the first part of the treatment, which was very trying to me and more so to her, as I was entirely uncertain as to the ultimate outcome and could give no positive ....

After almost daily efforts for three weeks the stricture was finally cleared by an accidental turn of the hand; this was more readily repeated on two or three occasions subsequently, but not without discouraging failures, when the ureteral orifice was definitely located on the side of the pyramid in relation to certain papillæ and the direction of the stricture was ascertained so that the catheter could after this be passed with ease. After pushing the catheter through the stricture it entered about 8 cm.; a distinct sense of resistance was felt in attempting to withdraw it, due to the bite of the stricture, which was about 1½ cm. long. So long as the point of the catheter went no further than the stricture no urine escaped, but as soon as the catheter cleared the stricture, pale urine began to pour out in a steady stream, continuing until 130 cc. was collected in three minutes. Sometimes the first urine drawn off would be of a reddish-brown color, followed by a whitish sediment, and at the last a thick, creamy fluid like pure pus.

The fact that so much urine escaped in so short a time proved conclusively that the case was one of extreme dilatation of the left urinary channels above the stricture, for the normal rate of secretion is but one cubic centimeter a minute for both ureters together, or one and a half in three minutes for one ureter. The discharge of 130 cc. would be twenty-nine times the normal amount, or at the rate of about twenty-two gallons a day for both sides together. Thus by a *reductio ad absurdum* proving that the case was a dilated pyo-ureter and pyelitis.

After drawing off all the fluid, a piece of fine rubber tubing with a funnel at the end was connected with the catheter, and a saturated boric acid solution, two-thirds of the quantity of fluid taken out, was run into the ureter by gravity, by simply elevating the funnel filled with the fluid from 40–60 cm. above the level of the bladder. Care was taken to have the tubes full of fluid so as to inject no air. The patient during these manipulations was in the knee-breast position. She took no anæsthesia, as the treatment was not painful. After introducing the catheter into the ureter she raised her body on her hands so as to make it horizontal, to better dispose the fluid to run out. When the injection was given she again let her chest down to the table, and rose again when it was to flow out. I found that I could wash the urinary tract repeatedly with the same fluid if I desired it, by holding the funnel high when the fluid should run in, and by holding it an equal distance below the level of the table when all the fluid would well back into it again, often bringing too a considerable amount of shreddy white debris from the ureter.

After the first few treatments of this kind she began to experience relief from her pain and was much less frequently disturbed at night.

An examination of the urine made by Dr. Barker in the pathological laboratory of the Johns Hopkins Hospital states that it was of a straw color, neutral in reaction, and containing an abundant muco-purulent, stringy, tenacious sediment. There was a small amount of albumen, but no sugar and no casts. The specific gravity was 1032. There were a great many polynuclear leucocytes, crowds of pus cells, and many diplococci, nearly all of which were within the protoplasm of the leucocytes. Octahedra of calcium oxalate were found, and a few cylindroids. There were no tubercle bacilli, and no other bacteria than diplococci, which were of the typical
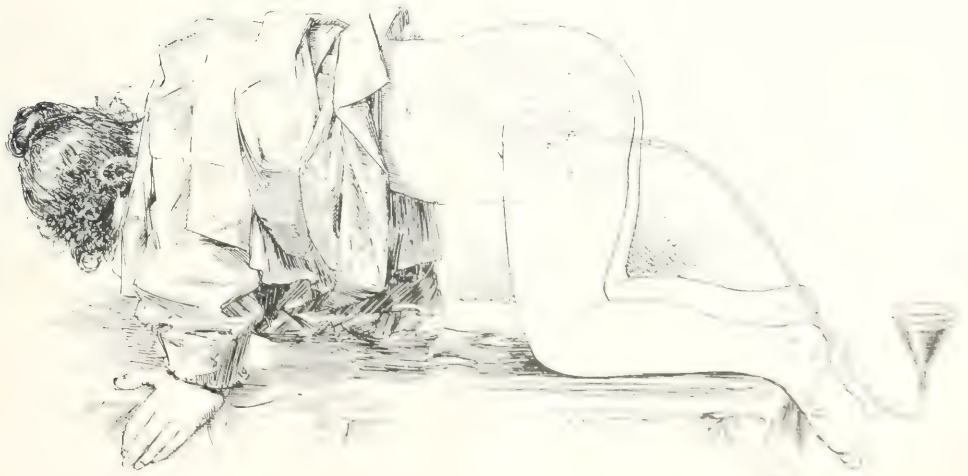
appearance of gonococci, and much smaller than staphylococci or streptococci.

The bladder walls were treated by occasional applications of a five per cent. solution of nitrate of silver, applied directly to the affected areas on absorbent cotton with an applicator, and by daily irrigations of a bichloride solution 1–150,000.

My first effort in the treatment of the case was to secure a continuous drainage of the ureter, avoiding all accumulation above the stricture, hoping by this plan to induce a contraction of the ureteral walls. To do this I made a short ureteral catheter 2 mm. in diameter and 5 cm. long, with a little shoulder about 2 cm. back of the inner end to keep it from slipping out of the ureter after introduction, and with a flange 6 mm. in diameter at the lower end to keep it from slipping altogether into the ureter. I placed this in the ureter by means of a searcher used as a mandarin to conduct it through the stricture. I found, however, that its presence gave so much pain and increased the irritation of the bladder, after being in place for twelve hours, that I was obliged to abandon its further use, although it acted well mechanically.

My next plan, which was successful in curing the case, was to have ureteral catheters made in four sizes, increasing from the smallest, 2 mm., to the largest, which was 5 mm. in diameter. The points of the catheters were blunt and straighter than the ureteral catheters ordinarily used, on one side almost on a line with the shaft.

In the course of two months the ureter was dilated sufficiently to permit the introduction of the largest catheter, from the end of which the accumulated urine would drop in a large free stream. With the catheters I began systematically to wash out the ureter and kidney with a bichloride of mercury solution 1–150,000, constantly increasing the strength until 1–16,000 was used. The treatment with the bichloride was interrupted several times for the injection of a one per cent. nitrate of silver solution, and once for a weak iodine solution. Towards the end while using the larger catheters I was obliged some six times to suspend the treatment for from two to three days on account of a chill followed by elevation of temperature from 102°–104° F. with a quickened pulse (120), headache, nausea and pain in the left inguinal region and legs. She was flushed and restless and suffered from sleeplessness at these times.

The result of the bichloride washings was a complete disappearance of pus cells, leucocytes and gonococci from the urine, and the reduction of the size of the distended ureteral tract from one holding regularly from 140–150 cc. down to 90 or 100 cc. The bladder assumed a normal appearance and she became able to sleep through the night without rising once. She gained 20 pounds in weight and resumed the rosy appearance of perfect health, with a corresponding remarkable improvement in spirits.

The treatments were discontinued August 8, 1894, and I saw her again in January, 1895, and then on two occasions catheterized the ureter, drawing off only 90 and 100 cc. of clear urine from the left ureter without a trace of pus or cocci. She has therefore recovered from the infection, but still has a stricture of the ureter of larger calibre with a lax distended ureter above it.

I made several attempts to empty the ureter by massage, with considerable success at first, but the procedure became so painful that it had to be stopped. Just before the massage the bladder was emptied by catheter, and immediately after treatment as much as 90 cc. of urine were secured.

I demonstrated the success of the massage and mapped out the exact positions in which to make pressure, by placing a catheter in the ureter with the patient in the dorsal position, with a rubber tube attached to its outer end, a straight glass tube 50 cm. long attached at the other end of the rubber tubing filled at once with urine to the level of the ureter and acted as a manometer. Respiratory movements were traced by its rhythmical ascent and fall. On making pressure over the ureter through the abdominal wall the column ascended in the vertical glass, and by increasing the pressure could be forced out over the top. If the pressure was made to one side there was only a slight effect or none at all. By marking all the points of effective pressure on the skin and afterwards connecting the markings, the course of the ureter was accurately mapped out.

The following novel and important points are demonstrated by this case:

1. Stricture of the lower extremity of the ureter can be diagnosed without any operation, by using the cystoscope with the bladder dilated with air by posture.

2. Stricture of the ureter can be improved by gradual dilatation by a series of hollow bougies (catheters) and without a kolpo-ureterotomy. (See Kelly, Johns Hopkins Gynecological Report, No. 1.)

3. A stricture through which a No. 5 (5 mm. diam.) bougie is passed every day for several weeks will still hold back the urine if the walls of the ureter above have lost their contractility.

4. Pyo-ureter and hydro-ureter can be diagnosed by drawing off in a few minutes such a quantity of fluid as it is manifestly impossible for the kidney to secrete in that amount of time.

5. Pyo-ureter and pyelitis can be cured by washing out the ureter and pelvis without any preliminary cutting operation to disclose the ureteral orifice (as in kolpo-uretero-cystotomy. Bozeman).

6. Variations in pressure in the amount of fluid in a distended ureter can be demonstrated by a manometer attached to the ureteral catheter.

7. In this way the course of the ureter can be mapped out

PRIMARY DIPHTHERIA OF THE LIPS AND GUMS.

By Simon Flexner, M. D., *Associate in Pathology,* and Herbert D. Pease, M. B., *Fellow in Pathology.*

[From the Pathological Laboratory of the Johns Hopkins University and Hospital.]

The bacillus diphtheriæ has by the more recent studies of the subject been shown to be present sometimes in pathological processes which do not present the characteristic features of diphtheria. Among these may be mentioned follicular or lacunar tonsillitis, fibrinous rhinitis and otitis media.* It has also been found, although associated as a rule with other micro-organisms, in infected wounds of the surface in persons who were not themselves suffering from diphtheria and who had not been exposed to the disease.† And in a comparatively few instances virulent forms of this organism have been found upon the mucous membrane of the healthy throat.‡

The significance of those cases in which the bacillus diphtheriæ is found in the body in the absence of the symptoms which usually accompany its presence, consists not so much in the danger threatening the host, as in the possibility of danger to other individuals, more susceptible perhaps, with whom such an infected person may come into contact. It is a growing belief that in just those cases in which the usual phenomena of diphtheria are wanting it is important to determine by bacteriological means the presence or absence of the Loeffler bacillus, for now, since attention has been directed to these atypical forms of diphtheria, reports of cases in which from a slight and unsuspected diphtheritic infection instances of typical diphtheria have taken their origin are not uncommon.§

These considerations have led us to report two cases in which recently the bacillus diphtheriæ has been isolated at autopsy from the membrane and exudate upon the gums and lips of two grown individuals. The appearances of the membrane in one and the exudate in the other case were in no way typical of diphtheria, and the cases obtain an additional interest from the fact that during life the patients presented no symptoms referable to the presence of the Loeffler bacillus. No other focus of diphtheria existed in the body as far as could be determined. The pharynx and larynx were both free from exudate or membrane, and thus while it must be assumed that in these cases the diphtheria bacilli often reached the mucous membrane of the pharynx, it must be admitted that arriving there they did no damage. The instances of laryngeal diphtheria in which the bacillus diphtheriæ can be found by cultures to be present upon the pharyngeal mucous membrane in the absence of any lesion in the latter situation are very well known.

The cases present, also, interesting examples of poly-infection with bacteria. That several different micro-organisms

may coexist in the body, each producing its effect, perhaps each a peculiar effect, is a fact not very infrequently demonstrable at autopsies upon human beings, and yet it is one not much emphasized in writings upon infection. The frequency and variety of terminal infections with bacteria in the course of chronic diseases, as determined by the bacteriological study of the autopsy material of this laboratory, have recently been described elsewhere.* The cases here reported are offered as additional examples of multiple and terminal infections.

Both of the cases are from the medical wards (Prof. Osler) of the hospital.

Case 1.—J. P., white, aged 67 years. He had been in the hospital on three separate occasions, the first being on the 17th of January, 1894. His symptoms at that time pointed to arterio-sclerosis and chronic nephritis. The second admission was on June 29th, 1894, at which time he was suffering from a double tertian malarial infection. The last admission was on October 17 of the same year. At this time he was suffering from dyspnœa and œdema of the legs. The urine was pale, its specific gravity never exceeded 1010, it was albuminous and always contained hyaline and granular casts. He incessantly scratched his legs, in consequence of which he developed a cellulitis of the left leg which was incised on January 17th, 1895. The subcutaneous tissue was found diffusely infiltrated, showing here and there pus pockets. Posteriorly there was a large abscess extending from the popliteal space, which it involved, to the heel. The suppuration was intermuscular, the fasciæ being dissected up and disintegrating. Muscles and periosteum were not involved. From the cover-slips and cultures streptococci were obtained. He died on January 20th.

Autopsy, January 21st (Dr. Flexner). The anatomical diagnosis was as follows: Chronic diffuse nephritis (small red granular kidneys); arterio-sclerosis; fibrous myocarditis; globular thrombi in right auricular appendage; heart hypertrophy; vegetative endocarditis (recent); sero-fibrinous pericarditis. Healed (?) tuberculosis of lungs; thrombosis of pulmonary artery without infarction; congestion and œdema of lungs. Tubercular peritonitis. Cirrhosis of liver. Cellulitis of leg. Acute gastritis. *Diphtheria of lips, gums and teeth.*

The following is the abbreviated protocol: Body 157 cm. long. Slightly built; emaciated. Oedema of ankles and hands. Suppuration of tissues of the left leg. *Oral cavity :* The mucous membrane of the lips is congested. Where the lips come in contact with the teeth there is to be seen upon the surface a greyish, necrotic-looking membrane, which upon removal leaves a defect in the epithelial covering of the mucous membrane. The resulting ulcer is deep red in color. The upper and lower lips are both affected, and the membrane is most marked over their central portions. The teeth are badly eroded, the crowns only retaining their enamel covering. The

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* Koplik, New York Medical Journal, 1892; Councilman, American Journal of Medical Sciences, November, 1893; Flexner, American Journal of Medical Sciences, March, 1895.

† Brunner, Berliner klinische Wochenschrift, 1893, Nos. 22, 23 and 24.

‡ Loeffler, Hoffmann, Fraenkel, Feer, and Park and Beebe.

§ Felsenthal, Münchener med. Wochenschrift, 1895, No. 3; Washbourn and Hopwood, British Medical Journal, Jan. 19, 1895.

* Welch: The Middleton Goldsmith Lecture, 1894.

gums are somewhat retracted, and covering the exposed portion of the teeth, and in part the gums, there is a membrane similar to that upon the lips. The mucous membrane of the tongue and pharynx is pale and free from membrane or exudate; the larynx also is free. *Peritoneal cavity:* It contains no excess of fluid. The peritoneum covering the lower zone of the abdomen, and particularly the pelvis, is covered with a large number of tubercles. These are either miliary or conglomerate in form; and some of them are surrounded by a zone of dark pigment. Tubercles also exist in the mesentery. *Intestines:* Except for some patches of congestion, nothing abnormal is to be seen. The mucous membrane is free from ulceration. *Stomach:* The mucous membrane is intensely congested and small ecchymoses and erosions are present within it. The surface is covered with sticky pus. *Pericardium and Heart:* The pericardial cavity contains 20 cc. of quite clear fluid, and both of its layers are covered with a fibrinous exudation, easily removed, and exposing congested vessels and small points of hemorrhage. The heart is hypertrophied and dilated. Upon the free border of the mitral valve several translucent, fresh vegetations are visible. The muscle of the apex is converted into fibrous tissue, and at this point there is a globular dilatation. The segments of the aortic valve are not shortened, but they are diffusely thickened. At the insertion of the middle segment a calcified patch occurs, upon which a fresh translucent thrombus is situated. The coronary arteries are extensively atheromatous. *Lungs:* The left shows retracted scars and small calcified areas. The right is free from tuberculous lesions. *Urinary bladder:* It is contracted and almost empty. The mucous membrane just above the trigonum is diffusely hemorrhagic, while in other parts it is injected and contains small ecchymoses.

Bacteriological Examination.—The bacteriological study embraced first the phlegmon of the left leg, the acute pericarditis, the vegetations on the heart valves and the acute cystitis. In the first and last streptococci were found in large numbers; in the other streptococci were also present, but in smaller numbers. The tubercles in the peritoneum were not examined for tubercle bacilli, but from their structure there can be no doubt that tubercle bacilli could have been demonstrated in them. The main interest, for the purposes of this paper, concerns the bacteriological study of the exudate upon the teeth, gums and lips, and the purulent material covering the mucous membrane of the stomach. The cover-slips made at the autopsy showed many bacteria in the membrane and exudate upon the lips. Among these were diplococci, small and large bacilli and chains of bacilli. Upon the blood-serum tube inoculated from the exudate a good growth was obtained in 24 hours. Cover-slips from this showed as the predominating organism a thin bacillus three or four times as long as broad, and which showed a tendency to grow in small clumps, the individuals being arranged side by side in nearly parallel lines, and also often placed at angles to one another. However, the size was quite variable, some individuals being five or six times as long as broad. A more striking characteristic was the variation in form, for slightly curved forms were to be seen, as well as forms with swollen ends or swellings elsewhere in their substance. This irregularity was all the more

distinct in that these swellings often possessed the property of staining more intensely than the remainder of the rods. This irregularity of staining was well brought out in preparations treated with Stirling's gentian violet stain, and subsequently with a 1:1000 solution of acetic acid. But Loeffler's methylene blue solution also sufficed to show the differences in a striking manner. Besides this bacillus only a coccus grew upon the blood serum, the greater number of organisms transplanted from the membrane refusing to be cultivated upon this medium.

From the morphology of the bacilli alone it seemed probable that the organism was the bacillus diphtheriæ, but to remove all doubt further tests were applied. The bacillus grown upon various media, namely, agar-agar, faintly alkaline bouillon, litmus bouillon and litmus milk, gave the following reactions. Upon agar-agar slants there was a faint growth along the line of the inoculation after 24 hours at 37° C. Later there was an increase in the width of the growth, but not in its thickness. It remained delicate and translucent. Single colonies upon agar-agar plates were not distinguishable from the colonies of a control culture. The ordinary bouillon and the litmus bouillon showed in 24 hours a faint cloudiness, which increased a little during the succeeding 24 hours and then remained stationary. A slight very finely granular sediment formed in the bottom of the tube, the bouillon, however, not having been rendered clear thereby. The first effect upon the litmus was to redden it slightly, and, comparing it with a typical culture of the bacillus diphtheriæ obtained from a case of faucial diphtheria, it was found that the two cultures produced the same amount of reddening in twenty-four hours; nor was there any perceptible difference until the fourth day, when the culture from the throat, which was used as a control, showed a somewhat greater reddening than the other. The litmus milk pursued a similar course, except that in it the acid production went on more rapidly, the control culture again showing on the fourth day a more marked acid reaction.

A half-grown guinea-pig received subcutaneously on February 11, 1895, at 2 P. M., one cubic centimetre of a turbid suspension from an agar-agar culture several days old. A node corresponding with the seat of inoculation had formed by the next day, but the animal did not appear to be ill. On the 13th the node had increased in size, the animal was quiet, sat in one corner of the cage with its hair ruffled, and showed a disinclination to move. It ate little. By the 14th the node had further increased in size and had by this time become very hard. It was incised and the tissues were found to be infiltrated with a greyish-white firm fibrinous material. Cover-slips prepared from this material showed large numbers of the typical bacilli. After several days the animal seemed gradually to recover. It began again to eat, no more formed at the seat of inoculation, and they had died it is still alive, although much emaciated. The ulcer has not yet healed.

From the properties which this organism exhibited there can be no doubt that it is the bacillus diphtheriæ, although not a form possessed of decided virulence.

The blood serum cultures from the stomach proved to

organisms. The predominating one was a short bacillus with sharpened ends, tending to grow in chains; and the other agreed with the bacillus isolated from the membrane upon the mouth both in form and in cultural properties. Its virulence was not tested upon animals.

To summarize this case, it is seen to have been one of chronic nephritis associated with arterio-sclerosis, heart hypertrophy and cirrhosis of the liver, in which there was a triple infection: 1, old tubercular lesions in the lungs and tubercular peritonitis; 2, streptococcus cellulitis, pericarditis and endocarditis; 3, diphtheria of the gums, lips and stomach. It may be questioned whether the diphtheria bacillus is to be considered the cause of the acute gastritis, and it must be admitted that the data at hand do not permit of a conclusion upon this point. But that the bacillus diphtheriæ may cause actual diphtheritic processes in the stomach has been shown by the bacteriological study of some cases associated with faucial diphtheria; and the variety of inflammations in the throat with which this bacillus is associated makes it more probable still that it may give rise under exceptional circumstances to an acute gastritis such as was present in this case.

Case 2.—A. R., white, aged 36 years, was admitted to the medical wards, January 30, 1895. He complained of dropsy and dyspnœa. On admission there was general œdema, which continued until death. *Lungs:* The patient had several attacks of brisk hæmoptysis. The cough was severe; the expectoration blood-tinged. On the evening of February 1st he had a chill, and the temperature, which hitherto had been subnormal, now rose to 102° F., and ranged from 100°–103° until the 9th inst., when it fell to normal. During these 8 days the signs were: dulness and flat tympany over the right upper lobe, with tubular respiration and large crackling, resonant râles. Breathing tubular. When the temperature fell on the 9th it was regarded as the crisis. The upper lobe did not clear up, tubular respiration with fine crackling râles being still heard on the 12th. On the 11th the temperature again rose, and it pursued a fluctuating course, ranging from 105.6° to 99° for two days. On the 13th dulness was found over the upper left front, and the vocal resonance was increased. A pure leucocytosis, reaching at its height 40,000, was present during the last days of life. *The urine* contained albumin, red blood corpuscles, pus and epithelial cells and blood, waxy, hyaline, granular and epithelial casts in abundance. Death occurred on the 14th inst.

Autopsy, February 15th (Dr. Flexner). *Anatomical Diagnosis:* Lung tuberculosis with cavity formation; chronic interstitial pneumonia with tubercular bronchiectatic cavities. Acute lobar pneumonia. Chronic diffuse nephritis (large white kidneys). Tuberculosis of the bronchial, tracheal and mesenteric glands. Fatty degeneration of the heart. *Diphtheria of lips.*

An abstract of the protocol is as follows: Body 170 cm. long, strongly built and well nourished. There is œdema of the extremities and face. *Lips:* They are covered with a greyish-white exudate, which, upon the separation of the upper and lower lips, adheres principally to the lower one. This exudate can be easily removed with the finger, and there is no defect of the epithelium visible beneath it. *Lungs:* The

upper lobe of the right lung is occupied by several cavities, the largest one being situated at the apex. The substance of the lung between the cavities is firm, pigmented and indurated. In the anterior portion there is a diffuse tuberculous infiltration, undergoing softening. Numerous small bronchiectatic cavities with caseous walls are present in this portion of the lung. Miliary and conglomerate tubercles exist in the indurated tissue of this lobe. In the apex of the left lung are two depressed pigmented scars. The entire upper lobe is consolidated, granular, and grey in color. There is no evidence of resolution in this lobe. The lower lobe is congested and œdematous. *Kidneys:* Together they weigh 475 grams. The average dimensions are 12.5x7x4 cm. The cortex measures 9 mm. The two kidneys are alike. The capsule strips off easily; the surface in general is pale, but shows a slight mottling with red. On section the striæ are coarse, the surface is œdematous, the glomeruli are pale. The consistence of the organs is diminished. *Pharynx:* The mucous membrane is pale and free from exudation. *Larynx:* A few superficial losses of substance occur in the mucous membrane, being most numerous over the true vocal cords. *Frozen sections* of the kidneys show the epithelium of the labyrinthine tubules to be granular and fatty. The tubules in the pyramidal portion contain at times blood-coloring matter. An occasional cast is met with in the tubules. The interstitial tissue is increased in foci.

Bacteriological Examination.—From the lung cavity tubercle bacilli and many encapsulated diplococci were found in coverslips. From the consolidated lobe of the left lung the micrococcus lanceolatus was obtained. But of especial interest is the result of the study of the exudation upon the lips. Coverslip preparations made from the exudate showed a variety of bacteria, among which the bacillus diphtheriæ was not recognized. The blood-serum culture gave, however, after 24 hours at 37° C., a growth in which the predominating organisms were a bacillus which morphologically resembled the bacillus diphtheriæ and a streptococcus. Discrete colonies containing one or both of these organisms were present upon the first tube, the majority of the transplanted bacteria having refused in this as in the previous case to grow upon the blood serum.

The bacilli were tested upon blood-serum, agar-agar, alkaline bouillon, litmus bouillon, litmus milk and potato, and compared with a known control culture. The bacilli from the exudate behaved in a characteristic manner in general, showing, however, one or two variations. In bouillon a slight sediment formed in the first 24 hours, which increased in the next 24 hours and then remained stationary, but a slight cloudiness persisted in the fluid. The bacilli were non-motile. On potato, after 24 hours at 37° C. there was no visible growth, but cover-slip preparations showed that there had been an increase of the organisms. At the end of the next 24 hours a slight greyish-white growth could be seen upon the potato. The litmus bouillon was rendered red in 48 hours in about an equal degree with the control culture. The litmus milk reaction was typical. Blood-serum to which an infusion of litmus had been added before coagulating the serum so as to obtain a blue medium, served excellently for demonstrating the acid-producing power of the organisms. There is a more rapid multiplication and more abundant growth of the bacilli

Taylor's Plaster-Jacket Stool.

Position of the Patient while the Jacket is applied.

upon it and, in consequence, a greater acid formation. The first appearance of red is in the water of condensation which collects at the lower part of the tube between it and the culture medium; the red color gradually extends over the surface and also into the depth. The final effect is to produce a diffuse and intense reddening of the previously blue culture medium, which shows especially well when viewed with reflected light.

A half-grown guinea-pig was inoculated subcutaneously with a solid culture, and at the site of inoculation there developed a well-marked local reaction in 2 days. The animal looked ill. At the time of writing (10 days after the inoculation) the animal still lives.

To summarize this case, it was one of chronic pulmonary phthisis and Bright's disease, the terminal event of which was an acute lobar pneumonia, to which was added in the last days of life an infection with the bacillus diphtheriæ.

There can be but little doubt, we think, that in both of these cases the diphtheria developed during the last days of life, although in the first instance the reaction was much greater than in the last. As the first patient had been in the hospital for a number of weeks, it is probable that the infection originated in the hospital. In the same ward a nurse developed a typical case of diphtheria just about the time of his death, and may easily enough have been the source of infection, although a reverse order is not to be excluded. These cases remind one, moreover, of the small group of cases of latent diphtheria which Heubner[*] has just reported as occurring in children, in which the disease developed insidiously and was unsuspected until laryngeal stenosis suddenly developed, or the fact was revealed at autopsy. The affected children had been in hospitals suffering from some chronic disease.

[*] Berliner klin. Wochenschrift, December, 1894.

A NEW APPARATUS FOR APPLYING PLASTER JACKETS, WITH A BRIEF REVIEW OF THE METHODS HITHERTO USED.

BY R. TUNSTALL TAYLOR, M. D.

[Read before the Johns Hopkins Medical Society.]

Having had charge for some months of the "Plaster Room" in the Children's Hospital, Boston, and repeatedly used the methods up to that time employed there, for the application of plaster jackets, it became obvious to me that the resulting jackets were not in *all cases*, what one might wish for in the treatment of Pott's disease.

These now familiar methods consisted of applying jackets in suspension of the patient, as originally advocated by Dr. Sayre, but more commonly in the prone position on a hammock, as advised by Davy and modified by Brackett.

The objection to the first method was the fright and fatigue it caused in the patients, and that the finished jacket in a short time allowed more or less forward flexion of the spine, in that it was not applied with the spine well extended backwards.

Actual distraction of the vertebræ from each other by means of suspension, which was formerly supposed by some and now even urged as an advantage in treatment by many, is slight and even questionable.

It may not be amiss in this connection to quote Dr. Sayre's early views and Bradford and Lovett's rather recent expressions in regard to this subject.

In November, 1874, Dr. Sayre first applied a plaster jacket by means of suspension. In speaking of a case he had one year later in September, 1875, in which he had made lead-tape tracings of the spine with the patient standing and then suspended, he says: "The change of position is seen; thus proving with mathematical certainty the alteration that had taken place in the *compensating curves* of the spine, *without, however, making any material change at the angle of the deformity.*"

Bradford and Lovett say: "Suspending a healthy person by the *head*, obliterates the physiological curves (cervical and lumbar lordosis, dorsal kyphosis), and the spine becomes straight, so far as its formation will allow.

"The spine of a new-born child becomes straight by suspension, but in an adult the changes in the shape of the bones, the strength of the ligaments and the tension of the muscles prevent the spinal column from becoming perfectly straight.

"In suspension by the axillæ or arms, the strain comes upon the latissimus dorsi, and though the superimposed weight, which would fall upon the lower part of the spinal column is removed, yet the curvatures in the upper part of the spine are not made straight.

"In suspension in old caries of the spine, it is only the physiological curves which are obliterated; the sharp kyphosis *is held too firmly by inflammatory adhesions* to permit of correction. *In earlier cases with movable vertebræ* the *intra-vertebral pressure must be in a measure diminished* at the point of disease by suspension, *but suspension does not cause a disappearance of the sharp angular projections at the point of disease, and in cases that present themselves for treatment the deformity cannot be corrected in that way.*"

These views I hold, and think I have seen clinically but little gained by suspension, in so-called distraction of the healthy from the diseased vertebræ, or in lessening the deformity in Pott's disease, the physiological curves being alone affected by it.

"The hammock method" of applying jackets offers certain advantages in lower-dorsal and lumbar disease, in that it affords a comfortable position and a snugly fitting jacket. But in the upper and mid-dorsal caries, we have to resort to other means in order to get a close fitting jacket near the sternum, which does not touch the hammock at its upper part. This is obviated by cutting wedges out of the top of the jacket where it does not touch the chest, and approximating the edges thus made by additional turns of the plaster bandages. Another means of gaining a like end by placing an

patient in such a position on the hammock that the hands just reach the upper cross-bar to which the hammock is attached, so that after the lower part of the jacket is finished, the upper part of the hammock may be cut through and the patient holding by his hands can sag down into a position of lordosis. In this position the jacket may be finished, though it entails a certain amount of fatigue to the patient. This, however, can be lessened by having straps or towels support the forehead and the thorax, where the jacket is already completed. By this method a nicely fitting jacket is obtained, but much time and care is required for perfecting it.

In very acute cases, however, it is well to resort to these methods of either suspension or recumbency, to lessen the pain incident to the superincumbent weight on the carious vertebræ.

With these methods before me, I had made the apparatus which I am about to describe. Its aims have been, first, to put the patient in as comfortable a position as possible, in which at the same time he can keep reasonably still; and secondly, that the position shall be such as to elevate the ribs and cause a backward bending of the spine, producing a certain degree of lordosis involving both the dorsal and lumbar regions.

The object of this is, that the centre of gravity of the body may be thrown further backwards and the superincumbent weight be removed more or less from the diseased body or bodies of the vertebræ, to the *healthy transverse and articular processes.*

The first of the aims, a comfortable seat, is met by utilizing a stool, on which is fastened firmly a bicycle seat, taking up no space laterally. The feet are supported on stirrups, made adjustable by a sliding joint and pin. The sliding joint works on a rigid rod, which in turn can be moved through an antero-posterior arc, so that the legs can be put in any desired position, by means of a bolt which passes through the arc and rod.

The second aim, that of the production of lordosis, is met by having an upright, which extends some distance above and behind the patient's head and has a cross-bar on its top making a T. From this cross-bar descend rods on which are handles. These rods are made adjustable at the cross-bar for long or short arms, broad or narrow shoulders, by a double joint, by which they can be moved up or down and also sideways. The central upright is attached near the bottom of the stool behind, by a joint which allows motion in an antero-posterior direction, regulated by a set-pin and an arc which projects back from the seat.

Thus it will be seen, when the patient grasps the handles, his arms being stretched upwards, and the central upright is moved backwards, the pelvis being more or less fixed, the result is the ribs are raised, the shoulders and spine are curved backwards. Then the jacket can be easily applied and carried higher up and closer over the sternum than is possible by other methods; an end which we wish to gain in all jackets for Pott's disease, thereby preventing as far as possible the forward bending of the spine.

Thus far the advantages presented by this apparatus seem to me to be, 1st, the jacket thus applied fixes the spine in the most advantageous position for lessening the tendency for the production of deformity. 2d, the rapidity and ease with which a jacket may be applied, as it requires, as a rule, no trimming at the crease of the groin in front nor in the axillæ, notwithstanding the fact it is carried high up on the sternum. 3d, it seems applicable to dorsal and lumbar caries, especially the former. In high dorsal caries these jackets should be supplemented by a head-support or jury-mast, as is done in jackets applied by other methods for disease in this region. 4th, it seems a comfortable jacket to the patient, as the thorax is well supported, and the superincumbent weight is removed from the diseased vertebral bodies to the articular processes and hips.

I wish to especially emphasize the importance of the rigid supports, for the hands and feet in this apparatus, as swinging ones were tried and found unsatisfactory.

Certain precautions are necessary for the successful application of a jacket by this method: firstly, to avoid fatigue to the patient the arms need not be elevated after the handle-rods and uprights are adjusted until just as the plaster-roller is to be applied, which although but a question of a few minutes will be found a point worth noting clinically; secondly, to insure a close-fitting jacket over the pelvis it is well to have the legs fully extended on the stirrups; thirdly, to avoid breaking up adhesions that may have already formed in partly anchylosed spines, it is not advisable to carry the backward bending to a point where discomfort is produced, which should be our guide in fixing such cases. Finally, in many cases to apply a comfortable and successful jacket a forward projecting rod is fastened to the central upright, from which a head sling extension can be used to insure support and further steady the patient when restless, nervous or in pain.

In none of the methods now employed is the "dinner pad" found necessary or used.

In conclusion, I wish to express my thanks especially to Dr. Hall, interne on the staff of the Children's Hospital, Boston, for his suggestions to me in developing the plaster jacket stool, and to Drs. Bradford and Brackett, Lovett and Goldthwait, I feel very grateful for permitting and encouraging me in the use of the stool at their clinics.

Fig. 1.—The Field of Operation through the Superior Strait. The bladder is freed from its connections above and dislocated downwards, and on the right side backwards to meet the short ureter. Its superior surface is seen uncovered by peritoneum. The angle in the middle is the lower terminus of the abdominal incision; the extent of the displacement of the bladder can be estimated by this. Forceps hold the ureter in place until the sutures are passed. A part of the ureter is seen lifted up free from the pelvic floor.

Fig. 2.—Schematic section showing the way the ureter was held by forceps and the relation of the sutures to the coats of the bladder and the ureter. All but the mucous coats of both were included.

Fig. 3.— The appearance of the ureter entering the opening in the bladder. One suture laid in place, but not tied.

Fig. 4.—Shows the snug union of ureter to bladder after both deep and superficial sutures were applied.

URETERO-CYSTOSTOMY PERFORMED SEVEN WEEKS AFTER VAGINAL HYSTERECTOMY.

BY HOWARD A. KELLY, M. D.

[Read before the Johns Hopkins Medical Society.]

The patient brought before the Society this evening (Jan. 21, 1895) is deeply interesting on account of the novel conditions attending an operation for the relief of a uretero-vaginal fistula.

She entered the Hospital in August, 1894, with an extensive carcinoma of the cervix, for which Dr. Russell, resident gynecologist, performed vaginal hysterectomy. The disease had extended so far out into the broad ligaments that he was obliged to place the ligatures at a greater distance from the cervix than usual. She recovered rapidly from the hysterectomy, but retained as a sequel a ureteral fistula in the vault of the vagina near the middle of the cicatrix. From this there was the usual constant leakage of urine, although she regularly passed the urine accumulating in the bladder from the other kidney. From a simple vaginal inspection it was impossible to say whether the flow from the cicatrix came from the right side or the left. It clearly did not come from the bladder, for it remained unchanged by the injection of a sterilized solution of milk into that viscus.

To decide which was the severed ureter I placed the patient in the knee-breast position and introduced my No. 10 cystoscope, when the bladder filled with air and I was able to inspect the ureteral orifices. By introducing a searcher into the left ureteral orifice I found that this ureter was intact as far as the posterior wall of the pelvis. Upon introducing the searcher into the right ureteral orifice it could not be carried in more than two centimeters, on account of meeting an impassable obstruction. The urine was seen flowing from the left ureteral orifice while nothing escaped from the right side. The demonstration was thus complete that it was the right ureter which was injured and the left was intact.

Having cleared up the diagnosis in this way I proceeded to operate to relieve the condition, October, 1894, seven weeks after the original operation by Dr. Russell.

Operation: The patient was placed in the Trendelenberg position and an incision 12 cm. long made through abdominal walls loaded with fat. Every step throughout the operation was embarrassed by the obesity of the patient. After opening the abdomen, the large fat omentum and intestines were dislodged from the lower abdomen and pelvis with great difficulty, and held away by means of cotton gauze pads.

The end of the ureter could not be found on the pelvic floor on account of the rigidity and inflammation surrounding the line of scar tissue between the rectum and bladder. The right ovary and tube were also pinned down to this scar tissue by numerous vascular adhesions. The attempt to reach the ureter at this point was therefore abandoned and it was sought out at the pelvic brim, where it was readily found after lifting up the caput coli and incising the peritoneum and pushing aside the fat. It was then traced from the point of crossing the common iliac artery down to the pelvic floor, exposing the whole length of the pelvic portion by splitting the peritoneum over its upper surface. The anterior portion of the ureter was involved in the inflammatory material surrounding the scar, which bled so freely that no attempt was made to dissect it out. Four centimeters of the length of the ureter lying directly posterior to the scar tissue were dissected out and the ureter lifted up from its bed and divided close to the scar, sacrificing as little as possible of its length.

I now found that although I had cut the ureter to the best advantage, I could not do more than merely bring it into contact with the bladder by pulling on it. It was of course evident that if I were to suture it to the bladder, exercising this degree of traction, it would pull out soon after the operation and I would have a uretero-abdominal instead of a uretero-vaginal fistula to deal with.

I was able to cope successfully with this formidable difficulty in the following manner: The bladder was dissected free from its attachments to the horizontal rami of the pubis on both sides, with scissors and fingers, and dropped down into the pelvis so as to extend it and carry it more into the back part of the pelvis, gaining at least 3 cm. in this way. By this means the ureter and the bladder were easily approximated without strain. I then made a small incision through the bladder wall, covered with fat at least a centimeter thick, at the point on the right nearest the ureteral end drawn straight across the pelvis. This incision passed through the peritoneum and was not more than 3 or 4 mm. in length and just large enough to receive the ureter snugly.

I then slit up the under surface of the ureter for about 4 mm., enlarging the caliber of its orifice to avoid a stricture, and with a pair of long delicate forceps introduced through the urethra, the bladder, and through the incision, I caught the ureteral end and drew it into the bladder and held it there while it was being attached to the bladder wall by about six fine interrupted silk sutures passed through the muscular tissue of the bladder and peritoneal and muscular coats of the ureter on all sides, beginning with the under side.

The ureter thus dissected out of its bed, and attached to the bladder, was stretched like a lax cord from the posterior part of the pelvis to the bladder, which lay gibbous and flattened out on the pelvic floor.

The abdominal incision was closed down to its lower angle, where a narrow gauze drain was inserted for fear of leakage. Care was taken in closing the incision not to draw together the peritoneum underlying its lower end, to avoid raising the bladder and indirectly pulling upon the ureter.

No leakage occurred and the patient made an uneventful recovery. The wound healed without suppuration. Her urinary difficulties were immediately and completely relieved with a complete restoration of continence.

At a subsequent examination I examined the abnormally placed ureteral orifice opening into the posterior

hemisphere of the bladder into which it freely discharged its urine.

This case is one of especial interest for the following reasons:

I was able to determine on which side the injury had been sustained by my method of sounding the ureter in the knee-breast position with the bladder distended with air.

I was enabled in this instance, by a simple but delicate plastic procedure, to secure at once a perfect result without sacrificing any important structure.

It has heretofore been necessary in order to cure a similar trouble to extirpate the kidney of the affected side. It has not yet been the good fortune of any operator in this country to anastomose the ureter into the bladder at a date subsequent to that of the operation at which the injury was sustained.

About a year ago I was invited by my friend, Dr. Boldt, of New York, to perform a similar operation for a similar condition. I found, however, upon opening the abdomen that the cellulitic inflammation, in the present case localized near the vaginal vault, in that instance extended up the ureter, encasing

it (periureteritis) and rendering it impossible to free any part of it without exciting a hemorrhage which would be beyond my power to control.

It is further important to note that the operations of uretero-ureteral anastomosis and uretero-cystostomy must not be looked upon as rivals in the same field. Where the ureter is cut far enough back from the bladder to permit an anastomosis of the upper into the lower end, the distance between the upper end and the bladder is too great to allow a uretero-cystostomy to be considered. Where on the other hand the ureter is cut near enough to the bladder to allow the upper end to be turned into the bladder, it will be found that the lower end is so short and so awkwardly placed that a uretero-ureteral anastomosis is not to be thought of.

There is one class of cases in which the procedure is elective, that is when the ureter has become lengthened and dilated by displacement upwards over a uterine myoma.

I would in this case elect to do a uretero-ureteral anastomosis if the ureter were dilated, or a uretero-cystostomy if it were of normal calibre.

TWO SUCCESSFUL CATARACT OPERATIONS ON A DOG.

By Robert L. Randolph, M. D.

[*Read before the Johns Hopkins Medical Society.*]

It is generally known that cataract is not uncommon in the lower animals and especially in the dog and horse. In the horse cataract is apt to be the result of recurrent irido-choroiditis, and this latter affection as seen in the horse is remarkable for its tendency to relapses, appearing often periodically and representing the disease known as "moon-blindness." Cataract, then, in the horse is almost always inflammatory in its origin.

When cataract is found in the dog there is no such history of a coincident inflammation, but we find a condition that differs little from the same affection in man. With regard to the operation for cataract in the dog no special difficulties are presented as contrasted with the same operation in man, except that we are compelled to use a general anæsthetic in the former case, and this is a disadvantage. Cocain has undoubtedly lessened the gravity of cataract operations.

It is evident that the healing process in animals is surrounded with far greater dangers than is the case with human beings, and it is this no doubt that deters us from operating for cataract in the lower animals.

Early last October A. W. Clement, V. S., of this city, brought to my office a handsome pointer dog. The dog was perfectly blind and had been sent to Dr. Clement for relief. He was eighteen months old and in fine physical condition generally. His master said that he had been going blind for three months, and at the end of that time only light perception was left. On the street he would crouch at his master's feet at the sound of an approaching vehicle and could not be dragged away till the vehicle had passed. When brought to my office and allowed to smell around the room he ran into the wall

and chairs at almost every turn. In being led one had to pull him along, as he was fearful of running into objects. On examination I found both eyes free from irritation. The pupils quickly responded to light. With the ophthalmoscope it could readily be seen that the lenses were opaque, and on using a mydriatic I found that they were uniformly and entirely opaque. The color presented by the cataract was more a milk-white than gray, not unlike what we see in the ordinary traumatic cataract when there has been extensive laceration of the anterior capsule and the whole lens has become immediately opaque. A similar appearance is presented by the so-called naphthalin cataract that I have produced in rabbits by feeding them on naphthalin in the manner described by Dor, Panas and others. Such cataracts belong to the variety known as soft cataract. I determined to perform discission, so the dog was first given a hypodermatic injection of morphia and then chloroformed. My instruments were boiled a half-hour before using them. Only two instruments are necessary, the needle and fixation forceps. The lids were held open by an assistant. At this time I operated on the right eye, and I may add that the pupil of the eye had been well dilated with atropia before the operation. The needle was passed into the cornea in the usual way and a crucial incision was made in the anterior capsule. Atropia was instilled and the dog was put into a small kennel and allowed to recover from the effects of the chloroform. The next day there was a large mass of cortical substance protruding into the anterior chamber. The recovery was absolutely uneventful and at no time were there symptoms of irritation. At the end of the first week Dr. Clement observed

that the dog went about the stable-yard with greater freedom. He was confined to his kennel for two weeks and whenever let out into the yard he was closely watched by the stable-man. In three weeks there was a perfectly clear pupil, and only within the extreme ciliary margin of the pupil were there any remains of the capsule to be seen. During this time atropia was dropped in the eye three times a day. At the end of three weeks I made the following test: I arranged several chairs in such a manner as to form a zig-zag path leading from one room through a narrow door into the adjoining room, and then went into the adjoining room and called to the dog. He came along the path laid out for him without a pause. This he did several times without striking a chair. I then placed a chair in the doorway and called to him and he jumped over the chair to me without the slightest hesitation. That day I operated on the other eye and used cocain. The dog was exceedingly restless and had to be held down. This restlessness was not due to pain but to nervousness, but it was enough to convince me that a general anæsthetic is indispensable. The operation was similar to the first one, and in five weeks there was to be seen only a small band of capsule lying in the pupillary area.

At this time it was impossible to detect anything wrong with the dog's vision. He moved about with freedom and rapidity, and ten days later his master, Mr. W. T. Wilson of this city, wrote me that he had taken the dog out on a hunt and had found him just as efficient as ever in so far as his hunting qualities were concerned, and that he jumped fences and ditches as readily as the other dogs in the field.

It seems then that the effect of the operation was to give the dog a vision that is practically perfect. At this time both Dr. Clement and I thought the case a unique one, and as far as I can learn it is unique in this country, but since then I have found quite a number of operations of a similar character reported in foreign journals. Among others, White Cooper[1] in 1850 gives an interesting account of some successful operations for cataract performed on bears in the London Zoological Gardens. Discission was the operation employed. Brogniez[2] reports a case of successful cataract operation on a horse nine years old, and Chégoin[3] operated successfully on an ass twenty-one years old.

As a general thing cataract in the lower animals appears in the earlier years of life, and when it occurs in the horse Crisp[4] thinks the cause is to be found in bad light and abundant exhalations of ammonia. Crisp is of the opinion that constitutional affections have little if anything to do in the causation of cataract in the lower animals, for usually the animals affected are well nourished and live for years. It will be remembered that the physical condition of my case was perfect so far as could be seen. Haltenhoff[5] reports a case of cataract in a dog associated with diabetes, but on the other hand Professor Moeller,[6] of the Veterinary School in Berlin, who has operated a number of times for cataract in dogs and horses, has never found diabetes present, and this has also been the experience of Professor R. Berlin.[7] I failed to test the urine in my case, but the general history of the dog would exclude any such complication; and I may add that in those cases of cataracts in rabbits produced by feeding them on

naphthalin, frequent examinations of the urine failed to show the least evidence of sugar, though some of the clinical symptoms of these cases suggested diabetes, as for instance progressive emaciation, hurried breathing, and an excessive flow of urine.

In speaking of the causes, though, of cataract, in dogs more particularly, it is well to note the fact that accommodative strain, which may be a factor in bringing about cataract in man, can here be excluded; and inasmuch as good vision was obtained in the majority of the cases reported, it is not likely that a disease of the retina or choroid had anything to do with the existence of the cataract. Another interesting fact in connection with this case is the rapidity with which the cataract developed. Within three months after the vision began to fail the dog was blind. I was struck by the shortness of the time required for the absorption of the lenses. Ordinarily, even in very young children, it takes at least two months before absorption is complete, while in those who are older, a year or more with several discissions is the rule. In the first eye absorption was practically complete in three weeks, and in the fellow eye nearly all the lens substance had disappeared at the end of five weeks. One would be apt to think that so far as usefulness was concerned the dog would be worthless, but it will be remembered that this was not so.

I am sure that the absolute necessity of artificial help in the shape of glasses for cataract patients is much overrated. There are cases on record (quoted by White Cooper) where after the operation for cataract the patients were compelled, for the sake of experiment, to get along without glasses—in other words, to accommodate their eyes to the new refractive conditions, and after a few months they could get along quite comfortably, though of course unable to read. The vision of every animal (man included) is no doubt limited to the needs of the animal. It is not likely then that dogs are possessed of human visual acuteness, and it is evident they do not require such vision. Certainly few, if any, demands are ever made upon the accommodative apparatus of the dog's eye, so that the loss of the crystalline lens would be attended with comparatively little or no inconvenience, and the same may be said of the horse.

Possibly the good sight in these cases is to be accounted for by a reproduction of the lens fibres, and in this connection I may refer to the experiments of Cocteau and Leroy d'Étiolles. These observers found that in a certain length of time after the removal of the crystalline lens in rabbits, dogs and cats, that another lens was formed. It is a curious fact that in several of these experiments the capsule showed no cicatrice, but was perfectly clear, and contained a lens as voluminous and consistent as the lens that was extracted, and differing in no respect from the latter. [unclear] reports a case of traumatic cataract that had occurred in a child, where, after the absorption of the cataract, later on in life new lens fibres were demonstrable. By [unclear] a reproduction of lens may have taken place in my case, but we are not justified in attributing the good sight and [unclear]

From investigations made in the London Zoological Gardens it has been found that cataract is common to nearly all of the lower animals, but it is a suggestive fact that cataract is most often seen in the two animals nearest man, the dog and horse. Neither extraction nor couching seems to be proper in operating on the lower animals. The impossibility of keeping the animal quiet, or of surrounding it with any of the usual safeguards, is an objection to extraction. While Moeller has had several successful cases of extraction, he states that his best results followed discission. As to couching, the danger of intraocular inflammation makes this operation quite as objectionable here as it is in the case of man. In my opinion discission is the only operation applicable to these cases. A general anæsthetic is indispensable. A bandage should not be applied, as it attracts the dog's attention to his eye, and it will be rubbed or torn off and injury to the eye would result. It is imperative to use a sterile knife, for we cannot here nullify the effects of infection by careful after-treatment, as we sometimes do in man. A small kennel is necessary, so that no temptation is offered to the dog to move about; and finally a 1 per cent. solution of atropia should be dropped in the eye three times daily during the first three weeks. As regards the anæsthetic to be used, my preference —from considerable experience—is in favor of ether, and I

have always been under the impression that it was particularly unsafe to administer chloroform to dogs. Dr. Clement tells me that he always gives chloroform and precedes the administration of it with a hypodermatic injection of morphia, and that he has never had any unfortunate results, a fact which he thinks is explained by the administration of the morphia.

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SIGMOIDO-PROCTOSTOMY.

AN ANASTOMOSIS OF THE LUMEN OF THE SIGMOID FLEXURE THROUGH THE LATERAL WALL OF THE RECTUM AT THE PELVIC FLOOR, WITHOUT SUTURE.

By Howard A. Kelly, M. D.

[Read before the Johns Hopkins Medical Society.]

I was obliged on the 20th of October, 1894, to perform a novel operation for the relief of an artificial sigmoid anus, consisting in the anastomosis of the sigmoid flexure into the lower part of the rectum on the pelvic floor, by means of traction sutures through the severed sigmoid, pulling it into a slit in the rectum, and bringing it out at the anus. By means of a pair of forceps laid across the anus grasping the sutures, the transplanted bowel was kept from retracting until a firm union had taken place between its outer surface and the edges of the incision. The entering bowel so snugly fitted the receiving bowel that no sutures were necessary to hold it in its new position. The patient recovered from the operation and has to-day, three and one half months later, normal bowel function.

The circumstances of the case were these: One of my friends, a skilful surgeon in the South, having a poor patient who could ill afford to leave home and pay traveling expenses and hospital charges, undertook to relieve her, giving gratuitous services. Her previous history had been one of pelvic inflammatory disease accompanied with severe suffering. She was 22 years old and had been married 3 years, without pregnancy. Her menstruation had been regular until two years ago, since which time it has been coming every 2 to 3 weeks, lasting 5 days and accompanied by much pain.

After placing her under an anæsthetic and opening the abdomen he found the pelvis choked by extensive adhesions. He began the enucleation, but it became so difficult that only the right ovary and tube were found and removed. Among the matted structures in the pelvis a narrow rigid tubular structure resembling the left tube was found, extending from the brim of the pelvis down towards the pelvic floor. This was brought up and tied off. As soon as it was removed it was seen to be a section of a strictured rectum, 6 cm. long. The remaining structures were so densely matted together that their identity could not be established in spite of a persevering investigation.

The injury to the bowel could not be repaired by anastomosis on account of the wide lumen of the upper sigmoid portion, and the rigid contracted rectal portion which was continued in the form of a long stricture as far as the pelvic floor. He therefore concluded the operation by suturing both of the divided ends of the bowel into the lower end of the abdominal incision, the sigmoid at the extreme lower angle and the rectum just above it. The incision 5 cm. long above this was closed, and the wound united and the patient recovered with two fistulæ, the active discharging sigmoid fistula and the quiescent rectal fistula.

Through my friend's courtesy she was sent to me two months

1. Shows the area of strictured bowel and the portion excised between the dotted lines.

2. Shows the strictured rectum closed and the incision made in the bowel on the pelvic floor. Traction sutures have been placed in the sigmoid flexure and drawn through the rectum.
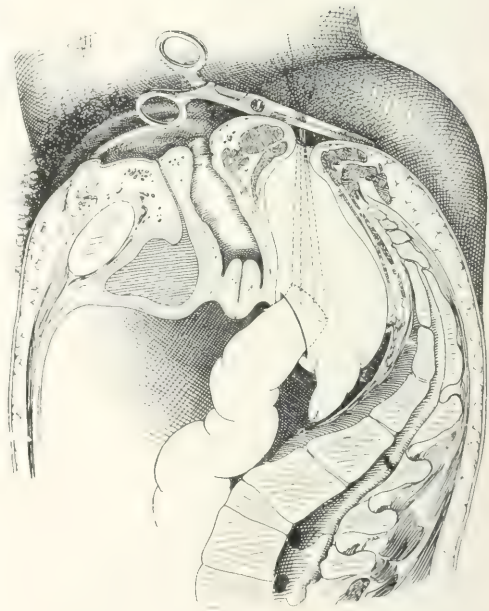
3. Sagittal section showing the sigmoid end drawn into the rectum and held in place by forceps clamping the traction sutures across the anus.

after his operation, for further treatment at the Johns Hopkins Hospital. At the examination I found an opening above the symphysis pubis about 3 cm. long, at the bottom of which were two orifices, a larger one below about 2 cm. in diameter, through which the index finger passed readily up over the left iliac fossa in the direction of the descending colon. This was manifestly the sigmoid anus. Immediately above it, separated by a narrow bridge of tissue, was a small orifice not quite a centimeter in diameter into which the index finger was pushed with difficulty. By continuing the examination bimanually a long tight stricture of the rectum from the abdominal wall down to a point behind the cervix uteri was detected. I think that my effort to explore the strictured bowel at this time must have ruptured its coats through into the peritoneum on the right side, for her sufferings increased from that date, with a daily rise of the temperature and quickened pulse. I found also at the operation a week later an opening through the bowel into the peritoneum walled in by extensive adhesions of the small intestines associated with a wide-spread colon bacillus acute peritonitis, proved by cultures, involving the whole lower abdomen and extending up to the left renal fossa.

I began the operation by dissecting out the entire scar containing the sigmoid and rectal orifices, these were then separated, and each wrapped separately in gauze and laid aside. The incision was now lengthened and the enucleation of the inflamed pelvic structures begun.

It was necessary in the first place in order to reach the pelvic organs to detach numerous loops of adherent coils of small intestines bound together by a fresh exudate and bleeding freely ; in three places the external muscular coat was so torn as to require suturing. On completing the separation an opening was found in the strictured rectum below the promontory of the sacrum on the right about 2½ cm. from the cut end and communicating with the peritoneal cavity.

The uterus and ovary and tube were so covered with dense fibrinous adhesions that it was impossible at first to tell where they lay, or to decide from appearances which tube and ovary had been removed in the first operation.

The uterus was finally discovered by cutting through the adhesions in the posterior part of the pelvis and letting out an encysted peritonitis of 120 cc., when the left tube was found and the position of the uterus traced by it; its enucleation was then continued by carefully following its contour and stripping up the adhesions, digging it out of a bed of densely organized lymph. The ovarian vessels were then ligated. The uterus was amputated in its cervical portion just above the vaginal junction after ligating both uterine arteries, and the stump of the cervix closed by antero-posterior silk sutures. The pelvis cleaned out in this way presented the appearance of a rough excavation, without any normal peritoneum, from the extensive stripping up of the adhesions on all sides.

The pulse which was 100 at the beginning of the operation, began to weaken from the first, and towards the latter part

it had become so rapid as to alarm the anæsthetizer, who repeatedly admonished me that the operation must be concluded quickly. Frequent hypodermics of strychnia were given without marked improvement.

The conditions at this stage in the operation were discouraging. I had before me in the first place a patient exhausted by an extensive peritonitis, who had just been subjected to a desperate pelvic operation, including suture of the intestines. I still had left a more formidable task in the establishment of a satisfactory anastomosis between the amputated sigmoid and a rectum converted into a dense tubular stricture all the way to the pelvic floor.

I overcame these difficulties and concluded the operation in five minutes in the following manner : 3 cm. of the upper part of the strictured rectum were removed, severing it below the rupture; I then approximated the wedge-shaped flaps with silk sutures, closing its lumen. This rested on the right side opposite the second sacral vertebra. The end of the sigmoid was then caught with six long silk traction sutures passed through the peritoneal and muscular coats, entering about a half a centimeter from the edge of the incision, and emerging on the incision, without piercing the mucosa. The walls of the bowel were from 3 to 4 mm. thick and somewhat rigid, without the flaccidity of the normal sigmoid.

I now made an oblique incision into the rectum on the pelvic floor just above and behind the vagina close to the cervix, below the lower end of the stricture. This incision was made through the abdominal incision about 3 cm. long, and directed from before backwards from left to right, the greater part lying to the left. With a pair of long artery forceps passed through the anus and ampulla and out through the incision into the pelvic cavity, the six traction sutures were caught in a bunch and pulled down and out of the anus, drawing the sigmoid into the rectal incision, which was held open with forceps to facilitate the entrance. The bowel was kept from slipping back into the pelvis by grasping the traction sutures in the heel of the bite of the forceps lying across the anus in the gluteal furrow. A rectal examination showed that about 1 cm. of the sigmoid projected into the rectum. The fit of bowel into bowel at the incision as seen from above was such a snug one that the line of division between sigmoid and rectum could not be detected.

It was my intention to fix the anastomosis by means of a few sutures uniting the sigmoid to the rectum, passed on the pelvic side, but I found this could not be carried out, as there was so little room between the bowel and the pelvic walls that I could not use either needle-holder or needle.

The pelvis was washed out and a gauze pack inserted around the sigmoid and another up among the inflamed bowel and brought out at the lower angle of the incision, which was closed to this point. She made an excellent recovery and has since had normal bowel function. Since removing the pack there has been a constantly decreasing purulent discharge from the lower angle of the wound : at no time has she passed fecal matter in any other way than per anum.

PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS HOSPITAL MEDICAL SOCIETY.

Meeting of January 7, 1895.

Dr. Abel in the Chair.

Exhibition of Surgical Cases.—Dr. Finney.

The first case I have to show to-night is one of very marked varicose veins of the leg. The internal saphenous and its branches were enlarged more than in any case I had previously seen. He was operated upon on December 29, 1894, the operation consisting of excision of the vein and its larger tributaries. He has done uninterruptedly well. There was no difficulty in the operation. The veins were very slightly adherent. An Esmarch bandage was first put on, which rendered the operation practically bloodless. We remove the first dressing to-night, and, as you see, the result is perfect. There is nothing especially interesting about the case except the enormous dilatation of the veins and the unusual length of the incision. I have here a photograph of the case before the operation, and also the specimen of veins removed, which I will pass around for your inspection. Only here and there were the vein walls thickened.

The patient's occupation was that of a fireman. He was on his feet a great deal and exposed to extremes of temperature, especially to heat. No family history of enlarged veins. His trouble began about ten or fifteen years ago. There was not much pain, but when he stood on his feet the veins dilated very much.

Various operations for the relief of this condition have been suggested from time to time, such as the ligation of the trunk of the vein about the apex of Scarpa's triangle below the saphenous opening, multiple subcutaneous ligation, and excision of portions of the vein. None of these have been found so satisfactory as excising the whole varicose mass.

Case 2. My second case is one of more interest. He is a man fifty years of age; occupation, mason. His previous history throws no light whatever upon his present condition. There is a tuberculous taint in the family history; no malignant disease. No venereal history. Has had measles, scarlet fever, varicella, rheumatism, typhoid fever and pneumonia; all pretty close together along about 1863. Has had hemorrhages from the lungs, but for two years past has had none. Has never had indigestion nor dyspepsia. Has no alcoholic history.

His present illness is as follows: In May, 1894, he had occasional attacks of great pain between his shoulder-blades, and at times on swallowing pieces of solid food would be regurgitated. If he attempted to swallow these pieces forcibly he would vomit and choke. He became gradually worse until he was admitted to the hospital on Christmas day. He was then unable to swallow even liquids. When he attempted to swallow water it took him a long while to do so. Perhaps a little entered his stomach, but most of it regurgitated. He was failing in health and strength rapidly and weighed but 94½ pounds. No history of traumatism nor of swallowing any irritating substance. An examination of his throat by Dr. Warfield revealed nothing.

Dr. Osler examined his lungs and found a few moist râles over the right apex posteriorly; otherwise normal.

When he entered the hospital he was in a very bad condition, having taken nothing for five days. We began giving him nutritive enemata, and his condition immediately improved very satisfactorily. After a while the rectum became somewhat irritated, and we thought it best to do a gastrostomy. This was done about ten days ago, December 29th. There have been from time to time various operations suggested; all having in view the prevention of the escape of fluids by a valve-like opening. Of these the best was perhaps Witzel's, which consisted in taking two parallel folds of the stomach, sewing together their free edges over a glass tube, thus making a sinus about an inch or more in depth leading to the opening in the stomach. This has been practised with good success. Hahn's method consisted in making the opening through the eighth intercostal space, giving a bony margin to the fistula. The operation which we performed upon our patient is known as Frank's method. This consists in making an incision in the ordinary place along the edge of the left costal border and about an inch from it. A second incision is then made about one and one-half inches to the left of and parallel to the original incision, and the skin dissected free from the ribs beneath. Then a fold of the anterior wall of the stomach is lifted out of the wound and tucked under this flap of skin and brought out through the second incision; after fixing it there with sutures the original incision is closed up. Frank recommends doing the whole thing at one sitting, that is, drawing out the portion of stomach, suturing it to the edges of the second skin incision, and then opening at once. In this case the patient's condition was so good during the operation and at the end of the operation that we decided to wait a day or two before making an opening. We did this and you can see the result. It is very satisfactory indeed. The patient now takes nourishment regularly through this opening. So far we have only given him fluids. There has not been the slightest leakage, so that the valve so far works admirably. We shall begin soon to give him solid food. He can masticate it, and through an apparatus it will be inserted into the stomach. (The patient was fed before the society with about 4 ounces of milk which was introduced through a funnel. There was no leakage.)

While the patient was under ether we passed an œsophageal bougie. We were able to pass it only to the depth of 23 cm. from the incisor teeth. A No. 8 bougie would not pass beyond the pharynx. The stricture is a very tight one. I got no idea of the nature of it from the bougie. Later when his condition improves we will begin attempts to dilate the stricture both from below and above. The most probable diagnosis is carcinoma.

Acute Pancreatitis, Disseminated Fat Necrosis, Parapancreatic Abscess. Dr. Thayer.

Dr. Thayer showed a patient who had suffered from acute pancreatitis with disseminated fat necrosis, followed by a parapancreatic abscess.

The patient was 34 years of age, a piano-polisher, and had a somewhat alcoholic history. For a year and a half he had suffered from occasional attacks of severe cramp-like pain localized about in the median line, across the epigastrium and about the umbilicus. Two weeks before entrance into the hospital he was seized with severe pain associated with vomiting. The pain was continuous; there was fever and, at times, delirium. On entry a deeply seated mass was found in the median line just above the umbilicus. It could not be separated, distinctly, from the liver, which was palpable on the right, while to the left it reached about to the costal margin. It was tympanitic on percussion, and very tender on palpation. The mass was not distinctly fluctuating, but gave one the impression that it contained fluid.

The *urine* was free from albumen or sugar; the *blood* showed a fairly well marked leucocytosis.

The diagnosis of acute pancreatitis, probably associated with disseminated fat necrosis, was made, and an operation was advised.

The operation by Dr. Finney revealed extensive disseminated fat necrosis in the omentum and subperitoneal fat, while underneath, in the lesser peritoneal cavity, there was a deep abscess, at the bottom of which the finger passed apparently into the pancreas. The abscess discharged thick creamy pus, showing numerous fatty acid crystals, bacteria, and masses of necrotic fat.

Cultures were unfortunately not made from the pus, as the opening was made unexpectedly several days after a preliminary operation. Cultures from the areas of fat necrosis made at the preliminary operation were negative.

Chemical examination of the areas of fat necrosis by Dr. Barker confirmed, entirely, the views of Langerhans, who demonstrated that the fat necroses consisted of a combination of lime with fatty acids.

Dr. Thayer then reviewed the main theories concerning the nature and cause of the fat necroses and their relation to acute pancreatitis. He mentioned the importance of an early diagnosis and operation in cases of this nature.

DR. FINNEY.—A word with reference to the operation. When we opened the abdomen we came upon a mass of necrotic fatty tissue which evidently concealed pus beneath. We had to open the general abdominal cavity to get at this. I thought it better to pack off the abdominal cavity with iodoform gauze and get it closed off by adhesions before completing the operation; this was why it was done in two stages. The mass was packed around with iodoform gauze, and five or six days afterwards when we thought the adhesions were sufficiently firm it was opened into. A good deal of pus was evacuated, together with masses of necrotic fat and what looked like pancreatic tissue.

DR. ABEL.—Dr. Abel said that it did not appear to him strange that calcium soaps were occasionally found in places far removed from the pancreas. As every one knows, the fats of our body are neutral fats and contain, under ordinary circumstances at least, only traces of free fatty acids. If, now, we find salts of the fatty acids, such as the calcium soap that has been referred to, present in an area of fat necrosis, we must assume that some agent has split up the fats and that

the calcium salt was formed secondarily. Now the ability to split up fats is met with in various parts of the body. Even the muscles, when removed from the body and kept with antiseptic precautions, exercise a feeble fat-splitting power on neutral fats, phenol esters and acid anhydrides. The liver, however, has this ability in a marked degree and stands next to the pancreas in this respect. From the experiments of Nencki, Lüdy, Salkowski and others we may fairly assume that neutral fats are constantly being split up in whatever tissues or organs they may be lodged. In the instance described by Dr. Thayer I think that all will admit that the accumulation of calcium soaps in the neighborhood of the pancreas is the result of the activity of the fat-splitting ferment of that organ.

Meeting of January 21, 1895.

DR. ABEL in the Chair.

Myxœdema and Exophthalmic Goitre in Sisters.—DR. ALFRED C. HEIMER.

In the London Medical Society in 1893, Arthur Maude reported cases of myxœdema and exophthalmic goitre in the same family. Two sisters with these diseases were in Dr. Osler's wards, and Dr. Osler has kindly asked me to report them.

Case 1. Miss A., æt. 19, admitted January 26, 1894, complaining of goitre and great nervousness.

Family history is negative, excepting her sister (Mrs. B.).

Personal history is negative.

Present illness began about three years ago after a severe fright. She became very nervous and has been easily excited ever since. The heart has been beating very rapidly, and for about eighteen months enlargement of the thyroid and exophthalmos have been noticed. The voice has been husky of late. The hands tremble, especially on excitement. The appetite is good; there is no nausea or vomiting; the bowels are regular. There is no cough or pain in the chest, but she has attacks of dyspnœa.

Status praesens: She is a fairly nourished, slightly built woman; face is markedly flushed; numerous areas of transient flushing. Lips and mucous membranes are of good color. Tongue clean. Marked double exophthalmos; no von Graefe's sign. Thyroid gland is much enlarged, symmetrical. Pulse very rapid, ranging from 100 to 140. Lungs and abdomen negative. Heart's apex in sixth space; very powerful and heaving impulse; the sounds are loud; first is booming, second both loud and clear. No murmurs. There is a fine tremor of the fingers. Urine negative; no sugar.

Patient was given the dried thyroid extract, five grains three times a day, during her stay at the hospital for fourteen days. She neither improved nor became worse, but lost two and a half pounds in weight. She left the hospital on February 9, 1894.

Her physician, Dr. M——, ——, has had to discontinue the thyroid because of the increase of nervousness. She has been taking tincture of belladonna min. xv t. i. d. for two months and has improved somewhat. In the fall she was advised to take the thyroid treatment again. On November 22,

1894, the goitre was much smaller and the exophthalmos less marked. She is, however, very irritable, and does not obey orders.

Case 2. Mrs. B., sister of Miss A., æt. 37—multipara.

Personal history : Always healthy ; never had rheumatism or chorea.

Present illness : Onset about three years ago, after nursing two children with measles while she was pregnant. Some three months after birth of the child, she noticed that about two days before the menstrual period the whole body would become more or less swollen, though never pitting on pressure; this would disappear when the menstrual flow began. During the past year the menstrual periods have appeared at about six to eight weeks interval, and the swelling has always been more or less present, though worse at some times than others. The swelling never pits on pressure. Lately she has noticed that the skin has become dry and harsh and rough. She has also lost some hair lately. She always feels chilly. The appetite is good; the bowels are constipated. She is very talkative.

Status praesens : A woman of medium height, but giving impression of being very large. The face has a heavy, dull look ; the cheeks and neck are very full, almost œdematous in appearance. The face is somewhat expressionless, and complexion has rather a doughy character. The supraclavicular spaces are markedly full, though there is no distinct puffiness. The arms and legs are decidedly swollen, though not pitting anywhere, the skin having a resistant feel and being everywhere dry, and in places showing a scaling of epidermis. The finger-nails are thin and show marked longitudinal striations; edges are slightly everted and show irregularities. The hair is dry and coarse. The thyroid gland could not be felt; owing to the thickness of the neck the palpation was unsatisfactory. The abdominal and thoracic viscera negative.

The patient was given thyroid gr. v t. i. d., which in a week was reduced to gr. v b. d. She at once began to improve. She lost while in the hospital, 14 days, about 11.5 pounds, and in the first 25 days after leaving the hospital she lost almost as many pounds. Her pulse on admission was 60–70, and on discharge 80–100. She looked much brighter and felt better.

Her physician, Dr. Melvin, writes, Nov. 1894, that she has steadily improved ; she is now taking only three grains every other day. She is eight months pregnant, and it is interesting, that while in previous pregnancies she was very nauseated, this symptom is absent in the present one. The amount of the thyroid extract could not be decreased during pregnancy.

These cases are of especial interest in their bearing on the question of the pathogenesis of exophthalmic goitre. Although the disease has been well known for fifty years, and studied with especial care of late, there is still much difference of opinion as to its cause. As the symptomatology has become more and more complex the theories have varied.

The classical triad has had many symptoms added, relating chiefly to the nervous system. It is difficult to say which of these symptoms belong to the disease itself and which are hysterical. The tremor of Marie and Charcot is considered a constant symptom. Paresis of almost every muscle has been seen. Charcot laid great stress on the paraparesis of the legs.

Paresis of the frontalis has recently been noted by Joffroy. The patient is requested to look down, and then, without raising the head, to look at the ceiling. A normal individual will wrinkle the forehead, but in exophthalmic goitre it remains smooth. This is not present in all cases, and is to be seen in some hysterical patients.

A peculiar œdema has been especially noted by Moebius and Maude. It does not necessarily occur in dependent portions, and resembles angioneurotic œdema. Non-pitting, hard, œdematous areas have also been seen. In a few cases (Sollier, Kowalewsky, von Jaksch) there has been true myxœdema associated with exophthalmic goitre.

To account for these symptoms there are at present only three well-supported theories : 1, that it is a pure neurosis ; 2, that it is due to a central (medullary) lesion ; 3, that it is due to increased and, perhaps, perverted function of the thyroid gland.

The chief arguments in favor of the first theory are:

1. The frequent neuropathic family and personal history. Cases of exophthalmic goitre in the same family are not uncommon.

2. The onset with emotion.

3. The frequent association with chorea, hysteria and epilepsy.

4. The absence of any definite lesion.

5. The cases cured by some slight nasal operation.

Against these may be urged that the meagre pathological testimony may be due to lack of skill. The mortality is too high and the acute cases totally unlike a pure neurosis. The patient's statements as to the onset and its causes are always to be looked on with suspicion.

The theory of a central lesion has been supported by Mendel, Hale White and others. Mendel's pupil, Mannheim, in his recent work sums up the arguments in its favor. He first premises that all the symptoms could be explained by bulbar lesions. Besides this, there are, pointing to the medulla—

1. The severe course of the disease and its combination with other spinal cord diseases.

2. Filehne's, Durdufi's and Bienfait's experiments, in which incision and stimulation of the corp. restiform. and tub. acustic. produced exophthalmos, tachycardia, and at times goitre.

3. The pathological evidence. Several observers have found more or less hemorrhage. Mendel found one restiform body smaller than the other, and atrophy of one solitary fasciculus.

In most autopsies, however, the central nervous system has been negative, and in Müller's acute cases only slight, recent hemorrhages were seen.

Finally we have the thyroid theory, led by Möbius in Germany, Joffroy in France, and Greenfield and Byrom Bramwell in England. The arguments for this may be stated as follows :

1. Morbid anatomy. In all autopsies some changes in the thyroid gland have been observed, and, frequently, these have been in the direction of functional hyperplasia.

2. The action of the thyroid extract. The effects of overdosage in myxœdema were called attention to soon after the introduction of the thyroid treatment. The symptoms of

over-dosage bear a striking resemblance to those of exophthalmic goitre.

3. The usual effects of thyroid administration in exophthalmic goitre is to increase the symptoms; there are exceptions to this.

4. The most successful line of treatment so far is that tending to diminish the bulk of the goitre. Out of 68 operations on record up to December, 1894, 18 completely recovered, in 26 there was more or less improvement, 9 showed no change. In 5 death was almost immediate (one of these cases was here), and in 4 death occurred within 24 hours. In 4 cases there was apparent cure, but the symptoms returned, and in 2 cases the operation was followed by tetany.

5. The striking contrast of the symptoms of exophthalmic goitre and myxœdema. This is well shown in the two cases whose histories are given above. This is the more striking as the cases occur in the same family, the only apparent bond being some affection of the thyroid gland.

6. Finally, the course of the disease is more like an acute intoxication. It is probable that the chief brunt of the intoxication falls on the central nervous system.

It would seem that some light might be thrown on the question by injecting animals with extract of the thyroid gland of exophthalmic goitre subjects. The disease has been observed in animals.

NOTES ON NEW BOOKS.

Practical Uranalysis and Urinary Diagnosis : a Manual for the use of Physicians, Surgeons and Students. By Charles W. Purdy, M. D., F. R. C. P., Kingston, Professor of Urology and Urinary Diagnosis at the Chicago Post-Graduate Medical School. With illustrations and colored plates. (*The F. A. Davis Co., Philadelphia*, 1895.)

The spirit of radicalism displayed in the spelling of one of the words of the title in a measure pervades the book, though in the main and important topics the author's ideas and advice are conservative, well written, and to the point.

The book's special value lies in the fact that it brings the study of its subject up to date, embodying late researches, tests and conclusions from scattered literature, with the older and more accessible knowledge.

The writer's aim, outlined in the preface, is most commendable, and the steps taken to reach the consummation of the work, namely, a correct diagnosis, are in good order and proceed in logical sequence, though perhaps it is a trifle too much to say, especially in italics, that "*as a rule he who has accurately diagnosticated disease has already constituted himself its conqueror.*"

Stress is laid upon the undoubted value of the centrifugal tubes, not only for securing sediment for quick examination, but also for rapid estimation of amounts of chlorides, phosphates, etc.

The important subject of albuminuria is well considered in a few pages and the older and newer methods for determining its presence are given, preference being indicated for the author's modified heat and for the ferrocyanide tests. This heat test simply consists of adding sufficient saturated solution of sodium chloride to insure the mucin being held in solution while the urine is boiled with a drop or two of acetic acid ; it is found an extremely delicate test in dealing with minimum amounts of albumin.

The author agrees with Von Jaksch that the presence of diacetic acid in the urine is of grave significance even if it is not directly, as Von Jaksch believes, the potent factor in the production of diabetic coma.

After presenting Ehrlich's considerations in regard to the diazo reaction, Dr. Purdy remarks, "the weight of clinical evidence strongly confirms all of Ehrlich's original claims for this reaction." Possibly in this belief many clinicians might not be able to agree.

That important new field of urinary analysis, viz., the determination of ptomaines and leucomaines, is referred to briefly. "It is strongly probable that careful investigation of the urine in this direction may throw important light upon a large class of diseases," says the writer.

Farther on in the pages devoted to the subject "The Urine as a Toxin," the somewhat recent experiments of several observers are alluded to with their conclusions. The deductions drawn, however, would seem to be rather too exact to be wholly trustworthy and needing farther confirmation before being set before students as established facts.

The book is of convenient size, well made, clearly printed, with sufficiently numerous illustrative plates, the quality of which is quite up to the average.

Aseptic Surgical Technique, with Especial Reference to Gynecological Operations, By Hunter Robb, M. D., Associate in Gynecology, Johns Hopkins Hospital, Professor of Gynecology, Western Reserve University, Cleveland, Ohio. (*J. B. Lippincott Co., Philadelphia*, 1894.)

It is not without a feeling of delicacy that I offer a brief review of Dr. Robb's book, as I am indebted to Dr. Robb for the dedication and have had the pleasure of writing the introductory note.

The work is quite a full presentation of the fundamental principle of surgical science, whether applied to general surgery or any of its branches. The author is thoroughly imbued with the modern spirit and well instructed in the recent teachings of the bacteriological laboratory in its relations to practical surgery. The relationship of all aseptic surgical technique to bacteriology has been properly emphasized by an excellent colored plate of the pyogenic micro-organisms which stands as a frontispiece to the book. The first chapter deals with the importance of a bacteriological training for the surgeon, and gives the characteristic features of the various pus-producing organisms. The principles of sterilization naturally follow this. The hot-air sterilizer figured on page 35 might have been omitted, as it is practically useless in the operating room.

In speaking of the failure of corrosive sublimate solution to act as a germicide under certain conditions, Dr. Robb might have cited with effect a series of experiments carried out by himself and Dr. Griskey, at my request, which entirely sustained Geppert's results. The list of instruments found in Chapter 5 will be found very useful to the gynecologist in preparing for operation or in writing out a list for his nurse.

It is a satisfaction to see a good picture of the sterilized ligatures standing in test tubes on reels (p. 96), and it is to be hoped that the wide introduction which the book has already had will introduce this method of Dr. Halsted's more generally to the surgical world.

The question of drainage is well stated, with one omission, viz., the gauze drain should have received more prominence. An excellent statement of this vital topic will be found in Dr. Robb's article published in Keating and Coe's System of Gynecology just published.

It is a satisfaction in turning over the pages to see that the author has here brought together the many important inventions with which he has enriched our gynecological technique for some years past.

The Kelly operating table fitted as described on page 91 is recommended with a simple, easily adjustable Trendelenberg apparatus. It would have been well here to show Edebohl's table which so admirably meets all the requirements of abdominal surgery.

In conclusion, the work forms a very satisfactory whole, and it is a pleasure to know that it is already making its way into the hands of surgeons all over this country.   H. A. Kelly.

A Manual of Organic Materia Medica and Pharmacognosy. An introduction to the study of the vegetable kingdom and the vegetable and animal drugs. By Lucius E. Sayre. (Philadelphia : P. Blakiston, Son & Co., 1895.)

The book opens with a short sketch of the general principles of botany, merely enough to enable the student to understand the botanical descriptions which are given. Then follows an interesting key in which the crude drugs of the Pharmacopœia are classified with reference to some leading physical property. In the main body of the work the drugs are classified with reference to their natural order, i. e. all those derived from the Umbellata, etc., are grouped together, but this classification can be controlled by an alphabetical index at the end of the volume. The author's descriptions are very succinct and accurate, and are rendered clearer by numerous illustrations. The work is further enriched by a short chapter on "animals injurious to plants," by brief remarks on pharmaceutical microscopy, and by a good glossary. In an appendix, some of the newer carbon compounds used in medicine are brought together, more with the object of showing the relation of modern synthetic chemistry to materia medica than with the purpose of discussing these compounds in detail. Chloroform, for example, is treated in four lines and alcohol in six.

At times the selection of German synonyms has not been very happy ; for example, the word used for aconite is Mönchskappe, whereas the German pharmacopœia mentions Akonitknollen, and the Commentary to the German pharmacopœia merely gives in addition Eisenhutknollen and Sturmhut ; again, the term Wolfkirschen Blätter is used for belladonna leaves, while that used by the German pharmacopœia is Belladonnablätter ; the Commentary and recent German works, as those of Kobert or von Jaksch, use Tollkirsche as synonymous with belladonna. We would call attention to a few typographical errors ; for example, in paracresotic acid there is one H atom too many in the benzene nucleus ; in asaprol, the formula for the acid portion of the salt should be doubled ; in phenocoll carbonate, the H_2 of the carbonic acid would better be omitted. The equation for sodium di-thio-salicylate should be

$$2 C_6H_4 <^{OH}_{CO_2H} + S_2Cl_2 = 2HCl + |^{S - C_6H_4 <^{OH}_{CO_2H}}_{S - C_6H_4 <^{CO_2H}_{OH}}$$
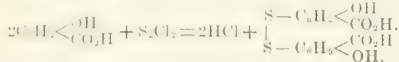
At times in the chapter on synthetical chemistry the C atoms are omitted from the ring compounds, at other times they are written in full ; it would be better to use a uniform plan.

The work, while not full enough for a reference book, is, as it was intended to be, an excellent modern work for pharmaceutical students. A. C. C.

BOOKS RECEIVED.

Syllabus of Gynecology, based on the American Text-Book of Gynecology. By J. W. Long, M. D. 12mo. obl. 1895. 133 pages. W. B. Saunders, Philadelphia.

Notes on the Newer Remedies : their therapeutic applications and modes of administration. By David Cerna, M. D., Ph. D. 2. ed., enlarged and revised. 12mo. 1895. 253 pages. W. B. Saunders, Philadelphia.

Surgical Pathology and Therapeutics. By J. C. Warren, M. D. Illustrated. 8vo, 832 pages. 1895. W. B. Saunders, Philadelphia.

International Congress of Charities, Correction and Philanthropy. I. Commitment, Detention, Care and Treatment of the Insane. Edited by G. Alder Blumer, M. D., and A. B. Richardson, M. D. —II. Care and Training of the Feeble-Minded. Edited by George H. Knight, M. D.—III. The Prevention and Repression of Crime. Being a report of the Fifth Section of the International Congress of Charities, Correction and Philanthropy, Chicago, June, 1893. Edited by Frederick H. Wines, LL.D. 1894. The Johns Hopkins Press, Baltimore. The Scientific Press Limited, London.

Tuberculous Pleurisy. (Shattuck Lecture.) By William Osler, M. D. Reprinted from Transactions of Massachusetts Medical Society. 8vo. 1893. 66 pages. Press of D. Clapp & Son, Boston.

Lectures on the Diagnosis of Abdominal Tumors. By William Osler, M. D. 8vo. 1895. D. Appleton & Co., New York.

Traité de Médecine. Publié sous la direction de Mm Charcot, Bouchard, Brissaud. 4to. 1894. Tome 6. 1392 pag . G. Masson, Paris.

A Location Reaction Apparatus. By Prof. G. W. Fitz. Reprinted from the Psychological Review, 1895.

Vaginal Extirpation of the Uterus and Adnexa in Pelvic Suppuration and Septic Puerperal Metritis and Peritonitis. By H. J. Boldt, M. D. Reprinted from the American Journal of Obstetrics and Diseases of Women and Children. 1895.

Hospitals for the Insane : their Scope and Design. By Edward F. Wells, M. D. Reprinted from the Journal of the American Medical Association. 1895.

Pyometra in a Cat. By T. S. Cullen, M. B. Reprinted from the American Veterinary Review. 1894.

The Cranial Nerves of Amblystoma Punctatum, with two plates. By C. Judson Herrick. Extracted from the Journal of Comparative Neurology. 1894.

Cerebral Oedema. By George J. Preston, M. D. Reprinted from the Journal of Nervous and Mental Disease. 1894.

Hysterical Pyrexia. By George J. Preston, M. D. Reprinted from the Maryland Medical Journal. 1894.

Experiments and Observations on the Summer Ventilation and Cooling of Hospitals. By Morrill Wyman. Reprinted from the Proceedings of the American Academy of Arts and Sciences, vol. xxx.

On Potassium Permanganate as an Antidote to Vegetable Poisons. By H. C. Wood, M. D., LL. D. Reprinted from University Medical Magazine. 1894.

Strontium Salicylate. By H. C. Wood, M. D., LL. D. Reprinted from the University Medical Magazine. 1895.

Contributions to our Knowledge of the Use of Animal Extracts. By J. G. Shoemaker, M. D., and H. C. Wood, M. D. Reprinted from the University Medical Magazine. 1895.

Ueber eine Färbemethode, mit der man Diabetes und Glycosurie aus dem Blute diagnosticiren kann. Von Dr. Ludwig Bremer. Reprinted from Centralblatt f. d. med. Wissenschaften. 1894.

Abstract of Introduction to Discussion on Gall Stones. Also the Anatomy of the Right Hypochondrium, relating especially to Operations for Gall Stones. By Rutherford Morrison. Reprinted from the British Medical Journal. 1894.

The Elimination of Ether and its Relation to the Kidney. By George B. Wood, M. D. Reprinted from the University Medical Journal. 1894.

Laboratory Guide for the Bacteriologist. By Langdon Frothingham, M. D. V. Illustrated. 8vo. 61 pages. 1895. W. B. Saunders, Publishers, Philadelphia.

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BULLETIN

OF

THE JOHNS HOPKINS HOSPITAL.

CONTENTS.

TUMOR DEVELOPED FROM ABERRANT ADRENAL IN THE KIDNEY.

By Thos. S. Cullen, M. B., *Assistant Resident Gynecologist, The Johns Hopkins Hospital.*

[Read before the Johns Hopkins Medical Society.]

H. J., æt. 49, German. Admitted in the service of Dr. Kelly, October 10th, 1894. Her complaint on entrance was pain in the lower part of the abdomen associated with swelling in the lower abdominal region. Her menses commenced at twelve and ceased six years ago. She has been married twenty-eight years and has had two children. Her family history is unimportant. Twelve years ago she had malaria, and for several years she has complained of frequent micturition.

Her present trouble commenced in May, 1894, when she noticed a swelling in the lower part of the abdomen. This has gradually increased and has been associated with a moderate amount of discomfort rather than actual pain. The swelling seems to be located on the right side.

Status præsens. The patient is apparently well nourished, but slightly debilitated. Her appetite is poor, her tongue flabby but clean, bowels regular. The urine has S. G. 1030, is amber colored, gives an acid reaction and contains a faint trace of albumen, and microscopically shows a few pus cells.

The abdominal measurements are as follows: Girth at umbilicus 100 cm., just above pubes 103 cm.; distance from pubes to umbilicus, 19.5 cm.; from ensiform cartilage to umbilicus, 19.5 cm.; from right superior spine to umbilicus, 23 cm.; from left ant. superior spine to umbilicus, 23 cm. To the left of the umbilicus there is slight flattening, to the right moderate bulging, and 6 cm. to the right of the umbilicus a distinct tumor can be felt.

Operation, October 11th, by Dr. Kelly. Incision was made in the median line under the supposition that the tumor was an ovarian cyst, as with the patient in the standing position it lay in the right iliac fossa and crossed over the median line just above the symphysis. On opening the abdomen the tumor was found to be retroperitoneal, and could not be reached on account of the excessive amount of fat. An oblique incision 12 cm. long was made midway between the lower border of the ribs and the crest of the ilium, and commencing posteriorly at the quadratus lumborum. A soft tumor was exposed and punctured on the supposition that it contained fluid. From the point of puncture free bleeding occurred, but no fluid escaped. The incision was enlarged by cutting upward and inward toward the ensiform cartilage. In doing this the peritoneal cavity was opened. Considerable difficulty was experienced in enucleating the tumor from its bed of adipose tissue. The tumor as well as the large vessels at the hilum of the kidney were tied off by about eight stout ligatures. A small gutter drain was introduced into the posterior angle of the wound, the peritoneum closed by silk sutures, the muscle and skin by silkworm-gut. The stitches were removed on October 19th. The patient made a good

recovery and was discharged on November 10th. The average temperature for the first ten days was 99.5°. Soon after the operation it dropped to 96°, but the same evening rose again.

PATHOLOGICAL REPORT.

The specimen consists of the right kidney, the lower half of which is of normal size, being 12 cm. long, 6 broad, and 5 in its antero-posterior diameter. It presents several foetal lobulations. The upper half, however, is greatly enlarged and the seat of a neoplasm. This part has an oval contour, is 18x18 x12 cm. in its various diameters, is covered with adipose tissue, and has a fibrous capsule which is directly continuous with the capsule of the kidney; thus it is apparent that the new growth has developed in the kidney. The tumor presents a yellowish mottling, and in the depth of the capsule numerous branching blood-vessels can be seen. On pressure it is yielding and elastic. On section the new growth presents a mottled appearance, the prevailing color being yellow. The consistence of the outer part of the growth is moderately firm, that of the central portion is soft, and evidently here and there is extensive necrosis with some hæmorrhage. At one point the tumor extends into the pelvis in the form of a pyramidal growth, evidently corresponding in shape and position to one of the renal pyramids (see Fig. 1). This tongue-like process of the tumor is 2.5 cm. long and 2 cm. broad, and projects free into the pelvis of the kidney, which it partially occludes. This projection shows no degeneration. The capsule of the tumor is directly continuous with the capsule of the kidney, and a layer of renal substance can be traced partly over the tumor beneath the capsule, indicating that the tumor has developed in the substance of the kidney (Fig. 1). Scattered throughout the capsule are numerous blood-vessels which appear as narrow slits. Extending inward from the capsule are trabeculæ which can be traced to the very centre of the tumor, where they are seen as delicate fibrils. The lower half of kidney shows no apparent change.

Histological Examination. The capsule of the tumor is composed of connective tissue very poor in nuclei (Fig. 2). The greater part of this tissue has undergone hyaline degeneration. Scattered here and there throughout the capsule are slit-like or round spaces lined by one layer of cuboidal epithelium. These resemble identically kidney tubules which have been compressed, and they are undoubtedly renal in nature. In a few places single or double rows of tumor cells are seen scattered throughout the connective tissue. The capsule is richly supplied with blood-vessels, the walls of which are merely composed of one layer of endothelium. The ingrowths from the capsule are also connective tissue in origin. These, however, have undergone almost complete hyaline degeneration, and in places are necrotic and infiltrated by many red blood corpuscles.

The tumor proper is made up of polygonal cells, occurring chiefly in double rows, but sometimes in rows of three or four (Fig. 2). The individual cells are sharply defined and vary considerably in size. Their protoplasm stains a light purple with hæmatoxylin, and with the oil immersion is seen to be made up of round globules, all of which are approximately the same size, and between which is a delicate granular material.

The nuclei of the cells are round, elongate oval, or irregularly oval. If the cell be small they are usually situated in the centre of the protoplasm; where the cell is large they are pushed to one side. Between the double rows of cells are delicate capillaries which are separated from the cells by one layer of endothelium. Most of the capillaries are only wide enough to admit the passage of one red blood corpuscle at a time; some of them, however, are dilated. Around a few capillaries are aggregations of lymphoid cells, associated with a small amount of new-formed connective tissue. On passing inward about 1 cm. from the capsule the tumor cells are seen to be necrotic. The capillaries are somewhat more resistant and can be traced a short distance further. The entire central portion of the tumor is necrotic. Specimens were stained for glycogen, but as the tissues were hardened in Müller's fluid the results were negative.

The kidney tissue in the vicinity of the tumor is greatly altered. The glomeruli show marked increase of connective tissue cells in their capillary walls, some of them being almost obliterated. The lobules are much atrophied, their epithelium is almost flat, and their lumina are filled with hyaline casts. There is great increase of connective tissue between the tubules, and the blood-vessels are dilated. The farther away from the tumor the less the pathological change. In all parts of the kidney, however, there is considerable alteration. Sections from the lower half of the kidney, where little if any pressure was exerted, show that the glomeruli are congested and enlarged, and that between the capsule and the glomerulus is a moderate amount of granular material. The convoluted tubules are dilated, their epithelium is somewhat granular, but their nuclei are well preserved. The collecting tubules are in some places dilated, the epithelium of these being flattened and pigmented. Their lumina contain hyaline casts. Scattered throughout the kidney is a moderate amount of connective tissue, which in many places has undergone hyaline degeneration. The capillaries between the collecting tubules are dilated.

Such tumors have frequently been described under the title, "Struma suprarenalis sarcomatodes aberrans," and have been dealt with at length by Horn, a student of Grawitz, also by Lubarsch* and others. They are usually multiple, are generally found in the upper half of the kidney, and vary from a cherry to a child's head in size. Most of them are yellow or yellowish red in appearance; some, however, are grayish. Each nodule is surrounded by a fibrous capsule and appears to be sharply defined. The large tumors show areas of softening in their centres. The adrenal gland may be intact or included in the tumor. Histologically the capsules of these tumors consist of connective tissue which may contain tumor elements. The tumor is made up of polygonal cells arranged in single or double rows. Some of these cells are cylindrical, and are so arranged that on cross section they present a gland-like appearance. The cells themselves have small, round, deeply staining nuclei which are surrounded by a large quantity of protoplasm. The protoplasm contains many fat

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* Lubarsch : Virchow's Archiv, Bd. CXXXV, Heft 2, S. 149.
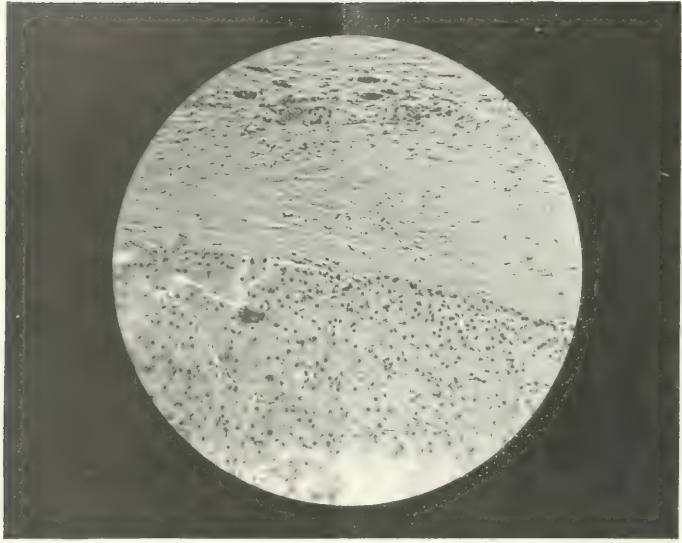
droplets of variable size, also small droplets of a homogeneous, highly refractive substance which gives the glycogen reaction. At times giant cells are found or nuclear figures may be made out in the tumor cells. The blood capillaries are very abundant and are only separated from the tumor elements by one layer of endothelium.

Some of the polynuclear leucocytes in the vessels may contain glycogen. The central portions of the tumor are frequently necrotic, and show numerous hemorrhages. From the histological appearances some have described these tumors as carcinomata, others as sarcomata, and they have not infrequently been thought to be endotheliomata, from their vascular arrangement. Microscopically the cells of these tumors resemble almost if not identically those of the adrenal gland. Grawitz accordingly concludes that these tumors arise from the adrenal elements. It is probable that in fœtal life small portions of the adrenal gland become included in the kidney substance, and that in after-life they undergo development. Metastases are frequent, having occurred in twenty of the twenty-nine cases reported. These have been found in the inferior vena cava, having extended by continuity from the renal vein, in the capsule of the kidney, in the retro-peritoneal glands, lungs, pleura, thyroid glands, and also in the glands of the neck. The lungs and pleura are the parts most frequently invaded. The secondary growths are identical in character with the original tumor, their cells being similar in character and containing glycogenic granules. These tumors may occur at any age; the most frequent period is, however, between forty and sixty. The symptoms are indefinite. The presence of a tumor in the renal region will, however, make one suspicious. In a certain number of cases blood is present in the urine, and in one case the urine contained tumor cells.

The present case is somewhat unusual, on account of the size of the tumor, also from the fact that it consists simply of one nodule. From the histological appearances it seems certain *that the tumor originated from a portion of the adrenal gland which had been included in the kidney substance.* Whether the entire adrenal was included or not it is impossible to say. It was not found on the surface of the tumor, but may have been left in the abdominal cavity. In concluding, I wish to thank Prof. Welch for his assistance in the preparation of the pathological report, and Dr. Hoen for the excellent micro-photograph he has made.

DESCRIPTION OF PLATE.

Fig. 1. Three-fourths natural size. The upper half of the kidney is occupied by a tumor mass which is surrounded by a capsule. This capsule sends septa into the tumor substance. The outer portions of the tumor are still firm. The centre is necrotic and is breaking down. The tumor at its lower portion has grown into the pelvis of the kidney.

Fig 2. About 250 diameters. Is a section taken from Fig. 1 at point *a*. The left half is tumor substance, the right half a portion of the capsule. In the capsule a row of tumor cells can be seen. The capsule also contains elongate-oval deeply-staining areas; these are cross sections of compressed kidney tubules.

THE BACTERIOLOGY AND PATHOLOGY OF DIPHTHERIA.*

By SIMON FLEXNER, M. D., *Associate in Pathology, Johns Hopkins University.*

The results of the researches of Loeffler published at the close of the year 1883 may be said to mark the beginning of the new era in the study of diphtheria, and whatever doubt surrounded his first publication regarding the relation to diphtheria of the micro-organism which now bears his name, has now been finally dissipated. The isolation of the Loeffler bacillus by workers in different parts of the world from the local lesions of the disease in many thousands of cases would seem to afford irrefutable evidence of the constancy of the relationship existing between the bacillus and the pathological process. Hence it is that attention has been directed to a consideration of other aspects of the subject than that of the presence or absence of the Loeffler bacillus in primary diphtheria.

The wide divergence of opinions regarding diphtheria which existed prior to the discovery of the bacillus diphtheriæ illustrates with what difficulty every advance in the study of a disease is accompanied so long as its ætiological factor is still unknown. It had long been a well-established fact that by a variety of agents, pseudo-membranes which offered more or less the appearances seen in diphtheria could be produced upon mucous surfaces in man and in animals; but it was at the same time recognized that none of these agents could reproduce the symptom-complex of diphtheria; and none of us are likely to forget the almost interminable discussion which arose as to whether it was primarily a local or a constitutional disease. Nor did the study of its pathology give much assistance in the solution of this question, and only after the specific micro-organism had been obtained in pure culture did it become possible, by a study of its properties outside the body and of its occurrence under natural conditions in human beings, to establish a rational basis for a classification of the disease.

First of all, then, it is important to distinguish between the anatomical and the ætiological significance of the term "diphtheria," and it will be found that a [limitation] of [the term to] a disease characterized by the presence of the bacillus diphtheriæ in the affected portions of [the lung will forward to] eliminate the confusion of pathological conditions which, while anatomically resembling [one another], are [sharply and quite] distinct.

The first question to which I would direct your attention

regards the proportion of cases of pseudo-membranous inflammations of the throat which are due to the Loeffler bacillus. In the first series reported by Loeffler himself, a certain number of the cases examined did not yield the diphtheritic bacillus; but of these, several were recognized as not having been cases of primary diphtheria. This failure to find the Loeffler bacillus in all pseudo-membranous inflammations in the throat and air-passages has been confirmed by later investigators. Thus in a table prepared by Escherich, in 679 examinations collected from Paris, Berlin and New York, the bacillus diphtheriæ was found in 427, or in 62 per cent. of all the cases. In a series studied by Morse of Boston, of 301 cases examined, the Loeffler bacillus was found in 217, *i. e.*, it was present in 72 per cent. of the cases. Park and Beebe report that of 5611 cases examined, positive results were obtained in 3255 (58 per cent.). The bacillus was absent in 1540 cases (27 per cent.), while 816 cases were doubtful.. The doubtful cases represent those in which for some reason or another satisfactory cultures were not supplied. If these, then, be disregarded altogether—although it may not be entirely fair to do this—we find that out of 4795 cases of suspected diphtheria, 68 per cent. were instances of true diphtheria.

It is acknowledged that the pseudo-membranous anginæ which are associated with the acute exanthemata are commonly not caused by the Loeffler bacillus, but are due in most cases to the invasion of the streptococcus pyogenes. In a series of bacteriological examinations made by Booker in such cases, the bacillus diphtheriæ was constantly absent; and Escherich, who studied fourteen cases of scarlet fever, states that the Loeffler bacillus is never present in the early days of the disease, but that in several of these cases they were found to be present later on, a fact which he attributes to the imperfect separation of diphtheria and scarlet fever patients in the Munich hospital, where his studies were carried on. He also found the Loeffler bacillus in certain cases of measles and whooping-cough, and he agrees with other investigators in holding that the acute exanthematous diseases predispose to infection with the bacillus diphtheriæ.

It had been observed by the older clinicians that during epidemics of diphtheria, pseudo-membranous inflammations of the throat in the course of typhoid fever were more frequent. Morse reports four cases of typhoid fever complicated with diphtheria; at least three of which developed diphtheria after admission to the hospital.

A purely local and perhaps non-contagious inflammation of the larynx has, by the bacteriological examination of a considerable number of cases of membranous croup, been shown to occur unassociated with diphtheria. These cases, however, are quite exceptional. Of 88 cases of membranous croup studied by Martin, 59, or 67 per cent., were of diphtheritic origin. The statistics of Park indicate that in New York fully 80 per cent. of the cases of the same disease are caused by the Loeffler bacillus. Of 229 of Park's cases, in 167 no membrane or exudate was found above the larynx. Welch and Abbott, Booker, Williams, Kolisko and Paltauf, Concietti and Fraenkel have reported cases of laryngeal diphtheria in which the pseudo-membrane was confined to the larynx and lower air-passages.

It is an undoubted fact that a case of so-called membranous laryngitis has not infrequently been the first of a series of cases of genuine faucial diphtheria.

Among the most important results of the bacteriological study of the inflammations of the throat and air-passages has been the discovery that cases which present the features of a mild catarrhal angina or of a lacunar tonsillitis may be associated with the presence of the bacillus diphtheriæ, and that from these can arise other cases in which membrane is found on the fauces.

This class of cases has been studied by Escherich and Feer, and especially by Koplik. Within the past few weeks I have seen two such instances in the practice of Dr. W. D. Booker, and from them obtained the Loeffler bacilli in cultures. The first was a girl of 16 years, who came to the surgical dispensary of the Johns Hopkins Hospital for enlarged glands of the neck. Upon examination she was found to have a lacunar tonsillitis. She suffered no inconvenience other than that resulting from the swollen glands. The plugs from the crypts of the tonsils contained the Loeffler bacillus. She made a rapid recovery.

The second was a child one and a half years of age whose tonsils were greatly swollen and almost meeting in the middle line of the throat. There was no visible membrane. Cultures from the throat showed the presence of the bacillus diphtheriæ. The local treatment recommended by Loeffler was used, and by the third day all symptoms of the disease had disappeared.

Heubner has just published a short series of cases, in which he calls attention to what he describes under the title of latent diphtheria. These were secondary to other diseases than scarlet fever and measles, and occurred in the young in the course of wasting affections, such as rickets, tuberculosis, etc., in hospital practice. The symptoms were fever, gastrointestinal disturbance, and slight bronchial and nasal catarrh. Heubner says that diphtheritic infection is not apt to be suspected in these cases until laryngeal stenosis suddenly develops, or the fact is revealed at autopsy by the finding of a false membrane in the pharynx or larynx.

Roux and Martin have found in the course of their inoculation experiments for the preparation of the anti-toxin, that animals which had been previously inoculated with other bacteria or their poisons, from which they had recovered, were more susceptible to the diphtheria toxin; and, similarly, that pregnant animals or such as had just given birth to young exhibited a similar diminution of resistance.

The mucous membrane of the nose affords a favorite resting-place for the Loeffler bacillus. In pharyngeal diphtheria these bacilli are commonly present in the nasal secretion, even in the absence of membrane in the nose. Primary diphtheria of the nasal mucous membrane sometimes occurs. Such cases have been reported by Stamm, Baginsky, Abbott, Ravenel, Czemetschka, Townsend and Park. Of the last two writers the membrane was confined to the nose in 4 and 9 cases respectively. Escherich has seen one case in which the infection of the nasal mucous membrane took place through the tear-duct in a case of diphtheritic conjunctivitis. Katz has just reported a case of faucial diphtheria which developed in

a child exposed to infection from another child suffering from fibrinous rhinitis due to the Loeffler bacillus.

Babes first cultivated the Loeffler bacillus from the pseudo-membrane in diphtheritic conjunctivitis, and reproduced the disease by the inoculation of the organism upon the conjunctivæ of rabbits. A number of cases of pseudo-membranous conjunctivitis have since been found to be associated with the bacillus diphtheriæ, although it must be stated that not all are caused by this organism. In two cases which I examined for Dr. Hiram Woods the Loeffler bacillus was not found in the exudate, but streptococci were present in both. The results of Councilman's investigations would go to show that certain cases of otitis media are due to this bacillus.

The skin surfaces of the body would appear to be immune to the action of the Loeffler bacillus in the absence of any loss of continuity. Thus Wright cultivated the diphtheria bacillus from excoriated or ulcerated surfaces of the skin in 7 cases of diphtheria; and Park found this organism in wounds of the finger received by physicians while performing intubation. Cases of wound diphtheria associated with the Loeffler bacillus are reported by Brunner, Neisser, Treitel and Abel; but it is probable that most cases of so-called wound diphtheria are caused by other micro-organisms. The relative insusceptibility of the external surfaces of the body to infection with the bacillus diphtheriæ is illustrated by the behavior of tracheotomy wounds, which only exceptionally become infected with this organism. Faltonek examined 953 tracheotomy wounds without succeeding in a single instance in isolating the Loeffler bacillus. Other observers have been more successful, but in these cases the possibility of the contamination of the wounded surfaces with the tracheal secretion cannot be excluded.

Having now passed in rapid review the situations of common localization of the Loeffler bacillus upon the surface and in the cavities of the body, I would ask your attention to its distribution within the viscera. At the time of Loeffler's first publication he expressed a belief that the bacillus diphtheriæ was to be found only at the local site of the disease, and that it did not invade the tissues at all, or at least only exceptionally. He had cultivated it, however, in one case from the lungs; and later Kolisko and Paltauf and Babes isolated in rare instances a few organisms from the internal organs. The observations of Frosch, since confirmed by others, have shown that not uncommonly a few bacilli enter the circulation and may be cultivated from the internal organs at autopsy. They are not however only small in number, but their distribution is irregular, and it is necessary to transplant considerable quantities of material in order to grow them. Frosch cultivated the bacillus from the blood of the heart, the brain, pleural and pericardial exudates, pneumonic areas in the lungs, spleen, kidneys, bronchial and cervical lymph glands and liver. Booker has also obtained the organism from the internal organs. At the autopsy of a child of three years which had both pharyngeal and laryngeal diphtheria I obtained the bacillus diphtheriæ in pure culture from the heart's blood, cervical lymph glands, liver, spleen, lungs and kidneys, but, contrary to Frosch's experience, they were present, in this case, in large numbers in the blood,

glands and spleen. In this as well as in a later instance I was able to cultivate the Loeffler bacillus from bronchopneumonic areas, and also to demonstrate them in sections from the bronchi and lung tissue. The predominating organism, however, was the micrococcus lanceolatus. Kutscher has just shown that the Loeffler bacillus exists at times in considerable numbers and may be the predominating organism in cases of broncho-pneumonia associated with diphtheria, and he inclines to the view that it is capable of causing both bronchitis and consolidation of the lung substance. Wright has found the bacillus diphtheriæ in the internal organs in cases of human diphtheria, and he has also cultivated them from the liver, spleen, heart's blood and kidneys in a small number of experimental guinea-pigs. Abbott and Ghriskey found that after inoculating cultures of diphtheria bacilli into the testicle of guinea-pigs, small nodules containing this organism sometimes appeared in the omentum; and this bacillus has also been cultivated from the ecchymotic patches in the stomach and from the surface of the membrane in croupous gastritis. Of especial interest is the case reported by Howard, in which a bacillus in all respects resembling the bacillus diphtheriæ, except that it did not possess pathogenic properties for guinea-pigs, was cultivated in large numbers from the heart-valves in a case of acute ulcerative endocarditis and from the infarctions in the spleen and kidneys.

Notwithstanding the results of later and more searching studies which have necessitated a modification of the earlier views regarding the relation of the Loeffler bacillus to diphtheria, and notwithstanding the fact that it is now known that the Loeffler bacillus can develop not only locally upon the affected mucous membrane, it must be considered as proven that only a few organisms penetrate into the body; and there are undoubted instances in which the disease has pursued a typical, severe and even fatal course in which the bacilli have remained localized in the mucous membrane. Hence the local process is still to be regarded as the chief seat of the activity of bacillus diphtheriæ.

The study of the properties of this bacillus as it exists outside the human body and the results derived from the inoculation of susceptible animals would indicate that the effects which it produces upon the body are due to a soluble poison, a toxin, proceeding from its growth and multiplication. By means of this toxin, separated from the living bacilli, all the constitutional effects of diphtheria can be induced. For the production of the false membrane the presence of the bacillus itself is necessary.

The growth and multiplication of the bacilli in the false membrane in the pharynx, larynx and nose are associated with the formation of this toxin, which, entering the body, causes the symptom-complex of the disease. Sidney Martin has extracted from the pseudo-membrane an albumose which possesses the poisonous properties of the toxin.

We owe especially to Roux and Yersin and Brieger and Fraenkel our knowledge of the nature and properties of the toxin. According to their researches it belongs to a class of substances of albuminous nature, possessing poisonous properties for which the name proto-albumose has been proposed. Upon the presence and the toxalbumose of diphtheria has

been obtained in a pure form, but in its impure state it is found to possess extraordinary potency. Susceptible animals (rabbits, guinea-pigs, kittens) inoculated with it exhibit all the symptoms of diphtheria, not excepting the post-diphtheritic paralysis.

The study of the action of this bacillus upon animals has shown a material difference in the virulence exhibited by cultures derived from different colonies, those obtained from a single case showing at times wide variations in virulence. The guinea-pig being the animal most susceptible to its influence, is generally employed for testing these variations.

No less striking are the differences in the potency of the toxin produced by the bacillus, and it has been found that there exists a direct relation between the virulence of the organism and the intensity of the poison which it is capable of yielding.

It cannot be said that any such relation between the virulence of the organism and the severity of the symptoms has been shown to exist for human beings. Indeed, contrary to the results arrived at by Roux and Yersin—which seemed to indicate that a progressive diminution in the virulence of the bacilli corresponding with the mildness of the attack took place, and that the same thing happened during convalescence from a severe attack—Escherich, Tobiesen, and especially Wright, have shown that no such diminution of virulence occurs. Fully as virulent organisms may be found in cases which are mild from a clinical standpoint as in those of severer grade.

The question of individual predisposition or of resistance to the invasion of the bacillus diphtheriæ and to the effects of its toxic products has therefore to be considered in this as in the case of other infectious diseases. What the physical basis for this distinction really is we are probably still far from having discovered. A few of the conditions which favor or inhibit infection in human beings and in animals seem clear. Hence it is that the results of the recent studies of Wasserman and Abel upon the action of the blood-serum of healthy human beings upon animals previously inoculated with the Loeffler bacillus are suggestive, as they indicate that the serum of certain individuals contains some protecting substance, the power possessed by the serum of adults being greater than that of children.

It is quite established that the bacillus diphtheriæ may possess all grades of virulence down to complete absence of pathogenic power, and some confusion has arisen by the introduction of the term "pseudo-diphtheritic" bacillus to denominate an organism which, while it resembles the true bacillus diphtheriæ, is devoid of virulence for guinea-pigs. This bacillus was first isolated by Hoffmann, who regarded it as identical with Loeffler's bacillus. Roux and Yersin advanced the view that this so-called "pseudo-diphtheritic" bacillus represents an attenuated form of the true bacillus diphtheriæ, and the work of Abbott, Park, Koplik and Escherich lends support to this position. On the other hand, it is suggested that the name "pseudo-diphtheritic" should be reserved to designate bacilli which, though resembling the true diphtheritic bacillus, show certain cultural differences and are devoid of pathogenic effect for guinea-pigs. Such a pseudo-diph-

theritic bacillus has been found in a few cases of genuine diphtheria associated with the true bacillus diphtheriæ.

It must be confessed that our knowledge of the relation of the Loeffler bacillus to diphtheria and associated pathological processes has been much extended in the past few years. Thus this organism has been found in a large proportion of all cases of pseudo-membranous inflammation of the throat, and is the probable causative agent in all cases of true diphtheria. Those pseudo-membranous anginæ in which the Loeffler bacillus is not found are characterized in themselves and distinguished from cases of true diphtheria by the mildness of their course, their slightly contagious character and their low mortality; in Park statistics, excluding those associated with scarlet fever, the death-rate was 1.7 per cent.

That virulent diphtheria bacilli may be present upon the mucous membrane of the pharynx without giving rise to a false membrane is proven by those cases of pure laryngeal diphtheria from which the bacilli have been cultivated from the pharynx. Loeffler found in the throat of a healthy child a bacillus which was identical with the true bacillus diphtheriæ; later Hoffmann, Fraenkel and Feer found it under similar circumstances. In 330 healthy persons examined by Park and Beebe, who gave no history of contact with diphtheria, they found the non-virulent organisms in 24, virulent bacilli in 8, and pseudo-diphtheritic bacilli in 27. The examinations included for the most part children. Of the 8 cases in which virulent bacilli were found 5 were children in an asylum where from time to time true diphtheria occurred. Of the remaining three, one was from a house where a supposed case of croup had existed three weeks before. Two of the 8 children developed diphtheria some days later; the other six remained healthy. Loeffler recently examined the throats of 60 school children and found diphtheria bacilli in four. Of these two subsequently developed diphtheria, one a slight inflammation of the throat, the fourth remaining well.

The study by Park of the throats of persons exposed to diphtheria has shown that in 50 per cent. virulent Loeffler's bacilli are present. Of these 40 per cent. developed later the lesions of the disease. Park states that in the families from which his statistics covering this point were obtained the conditions for the transmission of the disease were most favorable. On the other hand, in families where the patient suffering from diphtheria had been well isolated, the bacilli were found in less than 10 per cent. of the healthy children.

Considered in the light of our present knowledge of the common existence of pathogenic micro-organisms, such as streptococci, staphylococci and pneumococci, in the mouths of healthy persons without necessarily doing harm there, these facts of the occasional occurrence of virulent diphtheria bacilli in the throats of healthy persons are less surprising. Doubtless it is necessary that a certain susceptibility to their action—a predisposition, if you prefer, must exist before their peculiar effects can be exerted. I beg to recall in this place the experimental results obtained from healthy human blood-serum as bearing upon this point. However, the figures furnished by Park and Loeffler would indicate that the presence of the bacillus diphtheriæ in the throat is far more significant even for the individual himself, to leave out of

consideration for a moment those with whom he may come in contact, than are the other pathogenic organisms mentioned.

The bacteriological study of convalescent cases shows that virulent bacilli may persist for a time after the disappearance of the false membrane. They are not uncommonly present after 2 to 3 weeks, and in a few instances they have been found after a much longer period. In a case reported by Park, and one also by Abel, they were still demonstrable on the 56th and 65th day respectively after the membrane had entirely gone.

The severity of the case has no influence upon the duration of the presence of the bacilli; the occurrence of nasal diphtheria as a complication seems to favor this persistence. Tezenas found in 12 cases complicated with nasal diphtheria that for a long time after the membrane had disappeared a serous exudation from the nose continued. In ten of these cases Loeffler bacilli were demonstrable so long as the secretion persisted, although they had long ceased to be present in the throat. Hence where cultures cannot be made it is recommended to continue the isolation of the patients for at least three weeks after the disappearance of the membrane.

It is probable that the bacillus diphtheriæ is capable of increasing only within the body of infected persons or in the seat of inoculation of susceptible animals. The bacilli are, however, able to remain alive and in a condition capable of causing infection for a considerable time when outside the body. Conditions which promote the drying of the organism and exposure to strong light are unfavorable for the preservation of its vitality. The individual Loeffler bacilli quickly die when allowed to become air dry. But in bits of mucus or membrane, particularly if protected from the light and preserved in a damp place, they may remain alive for a long time—upon old cultures from 5 to 15 months; in bits of membrane from 4 to 17 weeks. They have been cultivated from tableware and toys; from soiled linen which had been in contact with the sick; from the shoes and hair of nurses, and from the broom used to sweep the floor of a diphtheria ward. In view of these facts it is unnecessary to point out the importance of thorough disinfection and of the rigorous care that should be observed in disposing of the excreta of the sick.

The association of other micro-organisms with the bacillus diphtheriæ in the false membrane is by no means uncommon, although cases of pure diphtheritic pseudo-membranous inflammations are said to exist. The organisms usually associated with the Loeffler bacillus are the pyogenic cocci, strepto-, staphylo- and diplococci. Their presence is now known to be of great clinical and pathological significance, especially if they enter the deeper tissues, as they are wont to do. While the bacillus diphtheriæ is found only exceptionally in the adjacent lymph glands and internal organs, there exists a group of cases of poly-infection, especially with streptococci, in which the latter enter the circulation and invade the organs. Since the introduction of the anti-toxin treatment of diphtheria this class of cases has attracted especial attention. These cases had been recognized and studied by a number of investigators, and in this country especially by Councilman and his associates. Broncho-pneumonias, suppurations

of lymph glands and septic forms of diphtheria are attributed to these associated bacteria, particularly to the streptococcus. Roux and Yersin first pointed out the importance of this poly-infection, and subsequently Schreider, Mya, Barbier and Martin confirmed their observations. Funk, Roux and Martin and Bernheim have recently made careful experimental studies on this subject. The latter employed only organisms which had been associated in the diphtheritic membrane, and he found that the virulence of the Loeffler bacillus is increased both by being grown with the streptococcus or in the filtrate obtained from streptococcus cultures. A limited number of experiments with staphylococci did not show a similar increase in the virulence of the bacillus diphtheriæ, a result confirmatory of Mya's earlier experiments. On the other hand, in human beings, according to Morse's statistics, cases of poly-infection with staphylococci run a more unfavorable course than those with streptococci. Welch has criticized his conclusions and shown the improbability of their correctness.

The natural variation in virulence of the bacillus diphtheriæ led first unintentionally, and later purposely, to the rendering of animals immune to subsequent inoculation to the Loeffler bacillus. But it was soon observed that this method of securing immunity was capricious and unreliable. The use of cultures of bacilli attenuated by chemical agents, the injection of tissue fluids into another of an animal dead of a previous inoculation of the bacilli, the employment of sterilized bouillon cultures and of cultures grown in infusions of cellular organs, such as the thymus gland, while attended with success in some cases, were found to be precarious methods of securing immunity, and not at all adapted to large animals. The use of a virus obtained from bouillon cultures several weeks old by filtration has been successfully employed by Behring, Ehrlich and Wasserman, Roux and others, to render even large animals such as the horse immune to large doses of diphtheria cultures. And one of the surprising and significant facts which has resulted from the study of the changes induced in the body fluids of the immune animal consists in the discovery that they contain a substance which is capable of rendering other animals, and even human beings, immune from diphtheria and also of curing the disease after its development.

This anti-toxin obtained from the blood of immune animals, though antidotal to the poison of the bacillus diphtheriæ, exerts no power over the poison produced by the bacteria associated with the Loeffler bacillus in the pseudo-membrane, and thus it becomes clear why cases of poly-infection are less influenced by the anti-toxin treatment than those of pure diphtheria.

It is but a confirmation of an intuitive belief to find that in the blood of human beings well of diphtheria there exists a body similar to that found in immune animals. The experiments of Klemenciwicz and Escherich proved the correctness of this supposition, and Abel has just furnished a large number of observations with confirmatory results. In animals a certain time elapses after the inoculation of the toxin before the antitoxin appears, and it is found, after repeated doses of toxin, that a high grade of anti-toxic power is obtained in the blood serum. In human beings the blood taken on the 5th or 6th

day after infection shows no protective action; the protecting power appears from the 8th to the 11th day, and it persists a variable time. Sometimes it fails to appear at all. After some months it may be still present, though in a diminished degree, or it may have entirely disappeared. The longest periods of its persistence yet observed are 150 and 200 days.

These facts bear out the experience of physicians who have noted that diphtheria is not one of those diseases one attack of which affords protection to subsequent infection. Perhaps the individual differences observed are to be explained by the variation in the amount of healing and protecting substances formed in any case.

In cases of genuine diphtheria the Loeffler bacilli are found in large numbers in the pseudo-membrane, there being less in the deeper than in the older and more superficial parts. A lesion of the surface provides a condition favorable to their settlement and increase, a fact also borne out by experiments on susceptible animals. Where no previous defect exists it is probable that the toxin itself can cause a superficial lesion. The tonsils, which are the starting-points of many cases of diphtheria, afford an excellent nidus for the bacilli, on account of the incompleteness of their epithelial covering, even in health. The depth and extent of the necrosis of the mucous membrane vary in different cases; and the character of the pseudo-membrane is affected by the nature of the underlying structures; in the pharynx it is firmer and less easily separable than in the larynx and trachea, where a distinct basement membrane is found in the mucosa.

The earlier workers in the field of experimental diphtheria failed to find in the internal organs the lesions which had been described by Oertel in the tissues of human beings dead of diphtheria. These lesions consist of foci of cell-death characterized by extensive destruction and fragmentation of cell nuclei. In such areas of necrosis fibrin may be deposited.

Dr. Welch and I confirmed and extended these results of Oertel by experiments upon guinea-pigs, kittens and rabbits. Subcutaneous inoculation of cultures of the organism or of the filtrate in a bouillon culture 4 or 5 weeks old, produces, besides the local lesion peculiar to each, foci of cell-death in the adjacent lymph glands and in the lymph glands throughout the body; in the spleen, liver, lungs, heart muscle and intestinal mucosa. The kidneys show degenerative changes. When the dose is small and the animal lives several weeks the paralysis which belongs to the disease may develop. This phenomenon, first observed in animals by Roux and Yersin, was noticed among our animals. Interesting changes have been described in the peripheral nerves under these conditions by Sidney Martin. In some cases he observed defects in the myeline sheaths, which stained poorly in osmic acid, while in certain severe cases the sheaths had entirely disappeared. The axis cylinders were either intact or had undergone granular degeneration, and the continuity of some of the fibres had become broken. At times the muscles supplied by these nerves showed signs of fatty degeneration. These changes agree with those found by Gombault, Meyer, Leyden and Arnheim in human beings who had suffered from diphtheritic paralysis.

Albuminuria is a not infrequent complication of the disease, and casts may appear in the urine. In some cases the urine may be much diminished in amount, but uræmia is unusual; and hydrops, which seldom occurs, is, when present, of a mild grade. The heart is not uncommonly involved, and the lesions described are either parenchymatous degeneration, in the severer grades, associated with fatty degeneration, or interstitial myocarditis. The lymphatic glands of the neck become swollen, but show a slight tendency only to suppuration. Various complications due to the invasion of secondary micro-organisms occur.

A CASE OF CHOREA MINOR OCCURRING DURING AN ATTACK OF MANIACAL EXCITEMENT IN AN ADULT.

By Henry J. Berkley, M. D.

Mary H., æt. 47 years, was admitted to the City Insane Asylum on August 27, 1894, with subacute mania and general chorea, the musculation affecting the entire body.

The maniacal attack, which was preceded by a prodromal period of several weeks, began about the middle of July, and according to the report of the physician in attendance, was unaccompanied by fever, but, on the other hand, the circulation was very defective, the extremities being cold and bluish. In the third week after the beginning of the mental excitement slight jactitations of the facial and arm muscles were noticed. These muscular movements increased in severity, until the chorea was as severe as an ordinary case of St. Vitus dance in childhood.

On admission the patient was considerably excited, inco-

herent, talked in a rambling, silly manner, and had general choreic movements that were especially well marked in the upper extremities and in the facial muscles. There were, however, movements of almost all the other muscles. The hands and arms were moved in an irregular, purposeless way, the time of the contractions not differing in any manner from an ordinary case of chorea minor. There was no tremor about the facial or small muscles of the hands. The gait did not betray any incoördination, but the finer tests could not be applied on account of the mental condition. Articulation was not interfered with.

The physical examination showed a very anæmic woman, without bodily deformity or visceral disease. The heart's action was weak, rapid, ninety-six beats to the minute, but

there was no murmur. There was no elevation of temperature. The tongue was furred, the vegetative functions disordered. Menstruation had entirely ceased for several years.

The irides were slow to react to light or accommodation. The deep reflexes were subnormal, the superficial a little slow. The urine contained neither sugar nor albumen.

During the month of September the choreic movements gradually diminished in intensity, though no medicine was given to influence them, and by the middle of October had almost ceased, only an occasional incoördinate movement of the facial, arm or neck muscles betraying the presence of clonic spasm.

On October 17, the patient was again thoroughly examined. The mental excitement had almost abated, and the woman was considerably demented. She would occasionally answer a direct question by some irrelevant monosyllable, usually the word "why" to all interrogations. The physical condition had improved considerably, the eye irregularities and the deep reflexes had returned to the normal. There was no heart lesion, both the first and second sounds being clear. The pulse was rapid, ninety-six to the minute, there was no irregularity.

December 28.—The physical condition of the patient is still improving, while the mental remains stationary or is slightly worse. The mental reduction is very considerable; she is untidy, tears her clothes and soils her room. Will occasionally answer a question, though never to the point. The pulse now stands at one hundred and four beats a minute. The irregular muscular movements have entirely ceased for a number of weeks, having endured in all a little more than three months.

The family history offers but a single point of interest, namely, that two of the woman's three children (both girls) had chorea in childhood, from which they made a perfect recovery. The third child, a son, is not bright, and the whole family seem to be below the average in intelligence.

The family deny that there have been cases of insanity among its members, also, positively, that the mother ever had a previous attack of either chorea or insanity, a statement that is corroborated by an elder sister of the patient. On the other hand, they state that she has always been healthy until the past June, at which date the first symptoms of the mental disorder were noticed.

The family are in poor circumstances, and it is more than probable that insufficient and improper food played a large part in the causation of the mental trouble.

Whether the chorea had as its genesis an infection beginning during the first weeks of the maniacal excitement is problematical; certainly there was no coexisting rheumatism or other febrile disease at the time.

The case reverses many of our accepted ideas of the mental condition in chorea minor, and in this respect appears to be unique. Occasionally in chorea we find pronounced disturbances of the faculties of memory and attention, as well as other important mental faculties, and rarely acute melancholia may be present, or the patient may become in some degree demented, but in all forms of chorea, including chorea insaniens, the choreic movements always precede the mental disturbance, and never follow in its course. Again, primary chorea in a woman of forty-seven years running the course of an ordinary attack of St. Vitus dance, and tending eventually to a full recovery in the course of twelve to fourteen weeks, is practically unknown; such cases as do occur in this decade of life ordinarily inclining toward a chronic progressive type, and are not properly to be classed among the Sydenham choreas.

PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS HOSPITAL MEDICAL SOCIETY.

Meeting of January 21, 1895.

DR. ABEL in the Chair.

Progressive Neural Muscular Atrophy.—DR. H. M. THOMAS.

The two cases which I bring before you to-night illustrate a very interesting and rare form of muscular atrophy. One of the patients is at present in the hospital, and the other, his sister, kindly comes, so that we can have the opportunity of seeing them together. They both complain of weakness in the feet and hands, and besides this, as you see, the brother is suffering from another troublesome affection.

The family history of these cases is of interest. The brother says that their father's uncle on his mother's side and the son of this uncle also suffered with trouble in the hands and had difficulty in walking. Another first cousin of the patient's father, his mother's sister's child, also suffered from what was thought to be the same trouble. As far as they know, the patients here now are the only members of the family affected in the present generation.

The history of the patient is as follows: E. H., æt. 36,

Dispensary No. 86,927, applied to the dispensary for relief from the spasmodic movements about the neck and face. So far as he knows he was well as a young child and learned to walk at the proper time. He thinks that he was able to play as well as other children, but remembers that he never could learn to skate. When he was eleven years old he had some sort of skin affection of the chest for which he was salivated, and to this date he ascribes the beginning of the trouble in his legs. He was at that time unable to walk for a week. He had scarlet fever when he was about thirteen years old, followed immediately by typhoid fever, after which he had dropsy. Following this illness he had some difficulty in speaking plainly, which has gradually become worse. At first the weakness in his legs gave him very little trouble and he was inconvenienced only when he ran. He taught school from the time he was seventeen until he was twenty-one but had to give it up on account of the difficulty in walking. When he was about nineteen the weakness in his ankles had progressed so far that they would turn under him and cause him a great deal of pain. After giving up his school he learned to telegraph, and was employed in the telegraph

to three years ago; although he never was a rapid operator nor did he write a very good hand He himself noticed nothing particularly wrong with his hands until his attention was called to them here in the hospital. The weakness in his legs increased very gradually, and the deformity which is now present developed equally slowly. He has never complained of any sensory symptoms.

The spasmodic movements about his head and neck are difficult to bring into relation with the muscular atrophy, and perhaps it would be better to consider them as a separate affection. They began ten or twelve years ago, when he was about twenty-five years old. At that time he noticed a slight twitching in the muscles of the right side of the neck, coming on every afternoon and lasting about an hour. The twitching at first was slight and did not cause any movement of the head; it gradually increased and became more constant, until after a time he was never free from it, and the muscular contraction became so great as to cause movements of the head. At first he had some slight voluntary control of these movements. He was operated on twice in Chicago, the nerve having been once stretched and once cut. He derived no benefit from these operations and the disease gradually involved other muscles, spreading to the other side of the neck, and four or five years ago to the muscles of the face. At times he has slight tremors of the muscles of his arms and hands. Any excitement increases the movements; they, however, entirely cease during sleep.

As you see, the patient's head is usually held bent towards the left shoulder, with the chin up, and is in constant motion, the chin often being depressed and twisted until it touches the left shoulder. Occasionally the head is turned to the right. From time to time the muscles of the face are all thrown into tetanic contraction. Any effort to speak exaggerates these facial contortions. The platysmæ also are involved in the spasm. Every now and then the contractions cause slight movements of the shoulders and arms.

The patient speaks in a peculiar muffled voice, and often seems compelled to make a great effort to overcome some spasm of the muscles of articulation. Some words are, however, brought out in a clear, distinct tone.

We are inclined to think that this distressing spasmodic affection of the muscles is an example of torticollis involving many more muscles than is usual. This is in itself a most interesting condition, but this evening I wish to call particular attention to the case in respect to the muscular atrophy. You will notice that both feet are deformed, the left rather more than the right, but both in the same manner (Fig. 1). The heels are somewhat drawn up, the soles of the feet are opposed, the arches of the feet are exaggerated, and the feet are very thick through the instep. The toes are dorsally flexed. On the outer edge of each foot there are large hard calluses, due to the position of the feet in walking. There is very little evident atrophy about the legs or feet. The thighs, fifteen cm. above the patellæ, measure fifty-three cm. The largest circumference of the calves is thirty-four cm. All the muscles moving the hip-joints and the knee-joints are very strong. In flexing the ankles, the tibialis anticus seems to be the only muscle acting. An endeavor to make passive extension brings about exagger-

ation of the deformity. The peronei seem to be completely paralysed. The extensors are strong. The movements of the toes are very limited, but they can still be moved feebly.

No disturbance of sensation could be demonstrated. The knee-jerks and the reflexes from the Achilles tendons are abolished. The skin reflexes, plantar, cremasteric and abdominal, are active. In the calf muscles on both sides can be noticed wave-like muscular contractions, which are somewhat coarser than what are usually called fibrillary contractions.

The patient walks with a clumsy shuffling gait on the outer edge of the feet with the toes turned in.

If you examine the arms you will notice that the muscles of the neck and shoulder, arms and fore-arms are well developed, but that there is a marked atrophy in the small muscles of the hands. This is especially evident in the space between the thumbs and forefingers (Fig. 2), and on the ball of the thumbs. The muscles about the shoulders and elbows are strong, and also the muscles moving the wrist show no marked weakness. Adduction and abduction of the fingers are very weak, as are also the movements of the thumb. No fibrillary contractions are noticed in the arms; no reflexes are obtained from the tendons of the triceps muscles, and we have been unable to demonstrate any change in sense perception.

The electrical examination in the muscles of the arms and legs revealed a remarkable condition. The small muscles of the hands could not be made to respond to either the faradic or galvanic currents, nor could I, with any strength of current that the patient could stand, cause a contraction in any of the flexor muscles of the ankles except the tibialis anticus muscles. And in general the nerves and muscles of the arms and legs responded, if at all, only to extremely strong currents; thus— the ulnar nerve above the elbow showed a slight K. Cl. C. to a current of 8 M. A.; the musculo-spiral to 10 M. A. During the examination it was noticed that the muscles of the fore-arm were the seat of slight irregular spasmodic contractions. The muscles of the arms and legs in general responded normally to mechanical irritation.

The history of the sister is as follows:

Mrs. R., æt. 28, Dispensary No. 87,679, thinks she was a strong little girl, had measles, but can remember no other illness. Has been married eight years; has never been pregnant.

When about twelve years old her feet began to get a little weak, although at this time she paid very little attention to them. At times her ankles would turn under her and she was unable to learn to dance, or to take part in games that required much running. Her ankles gradually became weaker, and when she was eighteen years old she was advised to put on braces; this she did, and wore them for three years, but finding that they did not help her she discontinued their use. Her feet have very slowly grown worse, the right foot being worse than the left, and she has noticed that she has very little power over the right great-toe.

For the last five or six months the patient has had numb and tingling sensations in her hands, and when they get in the least cold she is unable to perform any of the finer movements with them, such as getting coins out of her purse, or a key out of her pocket and unlocking the door. She has not

Fig. 1.

Fig. 2.

noticed any other weakness about her hands nor any atrophy. She has occasional twitchings about the eyelids, but no other jerkings in the muscles.

Her general health is good.

Upon examination I think it is evident that her legs below the knee are smaller than they should be; she flexes the ankles fairly well, but in resisting my efforts to extend them, the toes are turned in, the inner border of the foot is drawn up, and the foot assumes a position quite similar to that of her brother's. The tibialis anticus is the only muscle of this group that is at all strong, and in short the same muscles are involved as in her brother, although in a less degree. The knee-jerks are present, but are somewhat subnormal.

In her hands, as you see, there is undoubtedly beginning atrophy of the small muscles, and their resemblance to her brother's is evident.

No fibrillary contractions have been noticed anywhere, and we have been unable to demonstrate any sensory changes.

The electrical examination revealed the same condition as that described in the case of her brother, and it is quite startling to apply very strong currents to muscles which act well voluntarily and receive no response.

I think there can be no doubt that these patients are suffering from the same disease, and it seems probable, although of course not certain, that the other members of the family mentioned in the history were similarly affected.

We have here a disease occurring in a family, characterized by a slowly progressing weakness and atrophy of certain muscles, beginning at about the time of puberty, in the muscles of the legs and feet, especially the peroneal group; accompanying this weakness there has slowly developed a deformity of the feet, *equino-varus ;* years after the onset, the small muscles of the hands have become involved, so slowly that it was not noticed by either patient.

Associated with this change in the muscles there is a very remarkable electrical condition. The muscles most involved cannot be made to contract by any current that can be used. In most of the other nerves and muscles of the body there is a very great decrease in their electrical excitability.

So far the symptoms are parallel in the two cases, but the sister complains of distinct subjective sensory disturbances, from which the brother is apparently entirely free. No fibrillary contractions or similar phenomena were detected in the sister's muscles, whereas in the muscles of the brother's calves there are coarse fibrillary contractions, and a peculiar unrest in the muscles of the fore-arm, not to speak of the intense torticollis, which is his most distressing complaint, but which we are at present unable to associate with the disease under discussion. It is, however, quite possible that a more extended examination of the sister might reveal some fibrillary contraction. In the brother the deep reflexes are abolished, and although present in the sister, are distinctly less active than is usual.

These cases are good examples of that form of progressive muscular atrophy which seems to occupy an intermediary position between the *spinal* forms on one side and the group collected together under the name of *muscular dystrophies* on the other. It is known by several names, and there is still a good deal of discussion about its pathology. Cases belonging to this class were described as early as 1856 by Eulenburg. Eichorst also described similar cases in 1873, and Osler in 1880 described a most interesting family, the Farr family of Vermont, in which many members were affected by an unusual form of muscular atrophy. Hammond in 1881, Ormerod in 1884, and Schultze in 1884 each recorded cases. Charcot and Marie (Revue de Médecine, 1886, p. 96) collected a number of cases, recognized them as a peculiar form of muscular atrophy and gave a very clear clinical picture, so that this form of muscular atrophy is known in France as the Charcot-Marie type.

Tooth (Brain, 1887), in England, quite independently describes the disease under the name of *muscular atrophy of the peroneal type.* He was followed by Herringham (Brain, 1888). Hoffman (Arch. f. Psych. etc., 1889, p. 660), in a long and thorough article, reviews the subject and suggests the name progressive neurotic muscular atrophy, as indicating his belief that the pathological basis for the disease was a slowly progressive degeneration of the peripheral nerves. Sachs of New York (Brain, 1890) wrote of the disease as the *peroneal form* or *leg type* of progressive muscular atrophy. He considered it a form of the *spinal* atrophies beginning in the legs. Hoffman's second article appeared in the first volume of the Deut. Zeitschrift f. Nervenheilkunde, in which he thinks it better to call the disease progressive *neural,* instead of *neurotic,* muscular atrophy. Bernhardt (Virchow's Arch., Bd. 133, 1893) proposes as a name for the trouble *progressive spinal neuritic muscular atrophy,* as he thinks that the spinal cord as well as the peripheral nerves are involved. Ferrier is of the same opinion (Brit. Med. Jour., 1893) and he suggests the name *myelo-neuropathic amyotrophy.*

The authors agree well as regards the clinical picture. It occurs either as a hereditary or a family affection. It often begins in childhood, causing great deformity of the feet. The muscles first affected are usually the small muscles of the feet and the peroneal group. The progress is very slow, and usually after several years the small muscles of the hands become affected before the muscles of the thigh show any weakness. In fact in certain cases the disease may begin in the hands (Hoffman). The disease may not begin until puberty or adult life. It is often accompanied by both subjective and objective sensory disturbances. The deep reflexes may be normal, diminished, or abolished. Fibrillary contractions and muscular twitchings are often present. Very generally there are marked changes in the electrical excitability of the nerves and muscles, consisting either in a loss or a very great increase of the excitability, and this may be demonstrated not only in the atrophic muscles, but also in nerves and muscles that are performing their functions quite normally. Bernhardt also described the same case in the family in which this was observed, the only complaint of becoming tired very easily and in whom he demonstrated this remarkable electrical condition and was from this able to make the diagnosis.

In regard to the pathology, there is a great deal of discussion. Hoffman refers to two old cases, one by Virchow and one by Friedreich, in which was found a marked degeneration in the

peripheral nerves as well as some slight degeneration in the columns of Gall, and he refers to the record of a case by Dubreuilh (Rev. de Méd., 1890) in which was found old degeneration of the nerves, most intense at the periphery, decreasing towards the spinal cord, and just observable in the anterior cervical and lumbar roots. There was also a slight increase of the neuroglia of the columns of Gall, and the pyramidal fibres were somewhat more deeply colored than usual. The gray matter of the spinal cord was normal. There were well marked degenerations in the muscles.

Hoffman does not consider that these observations determine whether the disease is primarily in the spinal cord or the peripheral nerves, but thinks that especial emphasis should be laid upon the lesions of the nerves as distinguishing these cases from the ordinary spinal form of progressive muscular atrophy, and I think we cannot go far wrong in following him in calling these cases *progressive neural muscular atrophy*.

Dr. Osler.—This disease is of great interest on account of its rarity. There have been very few observed in this country; I think Dr. Sachs has reported the only one. The Farr family, which came under my observation some years ago, had 13 members affected in two generations. I had a letter the other day from the son of my old patient, Wesley Farr, and he states that none of the members of his generation or in his family or in his cousins' have been affected. Many of them now are men and women past the adult period. He mentions that if the disease is beginning in him at all it is beginning with a "yanking" in his eyelids. It is rather remarkable in that group that in all the members affected it began late in life, all over 40, which has raised some doubt as to whether that family actually belongs to this type of the progressive muscular atrophies. These are the only cases we have ever had at this hospital.

Meeting of February 4, 1895.

Green Hair.—Dr. Oppenheimer.

Dr. Oppenheimer presented a specimen of green hair. The hair was from a patient, aged 58, a coppersmith, who came to the medical Dispensary in July, 1891. He had been a workman in copper works for four years, exposed to very fine copper oxide dust. He was not very cleanly in his habits. Since half a year or so he had had vague stomach symptoms; nausea, occasional vomiting, some distress, but no actual pain after eating; no colic. No pulmonary symptoms were complained of, and the examination of the chest and abdomen was negative. There was no line on the gums. He did not return after the first visit, but it was ascertained that he died two years later with a severe cough.

The chief point of interest was the hair. Like the specimen presented, it was a pale but quite distinct green. This was more true of the hair on the head and of the moustaches, but all over the body, in the axillæ, over the pubes and shins there was the same coloration. Copper was easily demonstrated chemically. Microscopically the hair was uniformly colored, no crystals being seen anywhere. The color was less marked towards the root of the hair. Boiling in water did not remove the color, but ammonia did so at once.

Greenish hair with men in copper works and in copper mines is not unknown. As far back as 1654 Bartholin noted its occurrence. Several observers since then have remarked on it, Kobert, in his "Intoxications Krankheiten," and Hirt, in his "Krankheiten der Arbeiter," both mentioning it. Petri in 1881 reported a case in which the root of the hair was free and crystals were to be seen.

On questioning at the copper works, it was found that the patient was an exception, the majority of men being free. They state, however, that it is only by scrupulous cleanliness that they avoid the coloration. They must wash their hair daily in a solution of soda, as ordinary water is ineffectual. The part first apt to be affected is the moustache, and next the head; though, if the latter is protected by a thick cap, it will be free. The color appears a few days after starting work, and is more apt to come in summer time, when they sweat freely. Then the underwear has a greenish tinge, wherever it has been thoroughly wet with sweat. They seldom have any gastro-intestinal disturbance, but a severe, distressing cough is not uncommon, and occasionally ends fatally.

Brassfounder's Ague.—Dr. Oppenheimer.

Dr. Oppenheimer also presented a case of "Brassfounder's ague." The patient came into Dr. Osler's wards first on October 9, 1894, complaining of colic and general weakness. He had been a workman in a large bell-foundry in the city for 4 years, employed in a room where the metal is melted. He was regarded as a case of lead poisoning; the colic, extensor weakness and a blue line on the gums pointed to this. He had also mitral stenosis. He left the wards October 15, 1894, and was again admitted on January 18, 1895, for dyspnœa, and other symptoms, due to lack of compensation. He gave the following history as regards his chills:

He is employed in the room where the metal is melted. For this, old copper, zinc and brass are melted in a vat; white fumes arise, and are inhaled, giving rise to a feeling of fulness and distress in the chest, and coughing. Later new copper is added, but this does not give rise to any fumes. He begins work at 7 A. M., and all melting is over by 4 P. M. If he is to have a chill, when he gets into the open air he feels tired and has pains all over, especially in the joints. About 6–7 P. M. he has a severe shake, lasting 1–2 hours; he takes a whiskey punch, goes to bed and sweats profusely; then he falls asleep. The next morning he feels exhausted and tired, enough so at times to keep him from work.

The following circumstances increase the probability of a chill:

1. Absence from work for some time previous.
2. Damp, cloudy weather.
3. Poor ventilation; thus the chills are more frequent in winter than in summer.

Out of 28 workers in his department, all have had chills. On a bad day nearly all will have a paroxysm. There are seldom less than two or three laid off, and occasionally all have been absent. There seems to be no difference in susceptibility.

According to Hirt, these chills were first called attention to in 1844 by Blaudet. Greenhow reported several cases in

1862, and his conclusions were practically the same as the patient's. Hirt had two paroxysms after inhaling the fumes. His description is as follows: "A few hours after inhaling the fumes there is a peculiar, uneasy sensation through the whole body, a feeling of prostration and weakness. This is combined with drawing pains in the back, and soon one is obliged to stop his work. Muscular pains appear next, at times in the upper, usually in the lower limbs; these may become very intense. With all this the pulse is quiet and the respiration not hurried. Soon after going to bed a general shivering appears, which usually increases to a well defined chill, lasting fifteen to twenty minutes. The pulse becomes rapid, as high as 120 to the minute. Coughing, which at first is unimportant, not more than a mere tickling in the throat, becomes severe and distressing, giving rise to soreness in the chest. Frontal headache sets in and is intensified with each paroxysm of coughing, making the condition almost unbearable. However, the height of the paroxysm is soon reached (in three to six hours), and the stadium decrementi begins with a profuse sweat. The symptoms abate and the patient falls into a deep sleep, from which he awakes with a quiet pulse and respiration, no cough, and only a slight headache, and some weakness to remind him of the paroxysm."

The description tallies very well with the patient's except that the after-effects were severer with the patient.

The white fumes, arising from the vats, precipitate as a powder. Dr. Aldrich has kindly examined this, and finds it contains zinc oxide and carbonate, but no arsenic.

Exhibition of Surgical Cases.—Dr. Platt.

Case 1. This boy, 11 years of age, came to us some seven weeks ago. He was run over by a heavy express wagon and fractured his right thigh. He was neglected by his parents or physician, or all together, for 15 days, and when he entered the Garrett Hospital the thigh was bent at a right angle at the point of fracture. I bring him before you to show what an excellent result can be gotten in a boy; a much better result than could be obtained in an adult. The injured extremity is only one-half cm. shorter than the other, which is quite within the normal limits of variation.

Case 2. This boy of 11 years is a case of congenital hypertrophy of the foot. I have never before seen a case where the foot alone and not the leg was involved. Sometimes we have hypertrophy of the toes or fingers, but hypertrophy of the foot is very uncommon. The mother is said to have had a severe cellulitis of the foot during pregnancy. An interesting fact in this connection is that every three or four months the patient has what appears to be an inflammation in the foot. One might think it was a case of beginning acromegaly, but I do not believe it is anything but a pure congenital hypertrophy of the foot. The patient can walk and run and has no tenderness, limitation of motion, or indication of a local disease in the foot or ankle.

Case 3. This little girl, about 8 years of age, has a congenital amputation of the forearm just below the elbow. She has two teat-like rudimentary fingers. The extreme upper end of the radius is of full size, while the ulna is rudimentary and can scarcely be felt. The rudimentary forearm is quite useful, enabling her to wash dishes and perform other household duties.

Case 4. This boy, 6 years of age, had a testicle incarcerated between the internal and external rings, both rings being tightly closed. The testicle was frequently bruised and painful. The people at one of the hernia institutes were anxious to inject him for the cure of a supposed hernia. The boy came into the Garrett Hospital, where I operated upon him. I exposed the testicle, and after stripping the cord up to the internal ring and making slow traction, succeeded in lengthening it sufficiently to reach the upper part of the scrotum; then by dilating the external ring from below it was made large enough to get the testicle through. The testicle was stitched to the bottom of the inverted scrotum and pulled down. It is now in the upper part of the scrotal pouch.

Case 5. This was a case of complete epispadias. The boy had only a trough out of which the urine dribbled day and night. I have performed upon him the five classical operations of Thiersch, which have spread over a long period of time. The result is very good. There was at first absolutely no closed urethra. He has now a complete urethra (with two small lateral openings, which will be closed later), through which he passes his water, and has very good power of control over his urine.

NOTES ON NEW BOOKS.

In the preface to this book the author states that his aim " has been to compile a work of value to the student of medicine both during his years of study as an undergraduate and in the early period of his professional career. The volume may also prove of value to the practitioner of many years standing for purposes of reference." Success in the effort to meet the requirements of two classes of persons in one volume is not easy of attainment, and is indeed possible only by making the book larger than would otherwise be necessary. Judged as a book of reference for the practitioner, Dr. Thornton's work is excellent, though portions are more elementary than is required for such use. To judge of it as a manual for the beginner a different standard must be adopted, because the latter in certain branches of the subject needs concise rules which he can remember instead of a systematic treatise, while in other branches the beginner, and he alone, requires full directions and suggestions. It is a common complaint that existing works on prescription-writing are not adapted to the beginner; and, as there is a demand for something better, the following comments on the manual in hand are made with a view to its usefulness in that direction.

Although in general this book is an improvement on its predecessors in the same field, it lacks the originality and independence of precedent which are necessary to the making of an ideal student's manual. Part I, on Weights and Measures, English and metric, is clearly and thoroughly written, but the impression is given throughout that the metric system is used as a translation from the English. Of course gr. xv equals ".9720 Gm." and one drachm equals "4.11 Gm." [illegible] of such fractions? As [illegible] a dose, why [illegible] is to come into general use (as it surely will), we must think in its units and not attempt to remember long decimals.

The twelve pages on prescription-writing and the four on principles of medical combination are excellent, so far as they go, but some of the paragraphs ought to be expanded into chapters, as the student finds his greatest difficulty in combining drugs in extemporaneous prescriptions. Prescription Latin, on the other hand, might profitably be condensed to its simplest rules instead of filling twenty-six pages. The sections on Incompatibilities and Solubilities are unusually good for reference purposes, but one looks in vain for a few general rules which the student can always bear in mind.

Part III, Official Preparations and Methods of Prescribing, is the most original part of the book and is full of useful suggestions, albeit the author has forgotten to include the oils in his thirty-nine preparations. The remainder of the volume, almost one half, has an air of padding to fill a required number of pages. Every text-book on materia medica contains a dose list, and the catalogue of drugs here given has no new feature to commend it to the student. Under a different arrangement, the lists of official preparations in the preceding part are duplicated. One of the chief errors of writers on this subject is to suppose a complete catalogue of drugs is needed by the beginner. In fact, such list is of value only as supplying a mass of material from which to select, and is wholly indigestible unless the student already knows how to gather the most useful articles from it. What, for example, is to guide him in choosing between the tincture, aromatic tincture, sweet tincture, fluid extract, syrup, and aromatic syrup of rhubarb? Is the young doctor expected to follow the list seriatim when he prescribes rhubarb, or is he to decide by lot what to select from Dr. Thornton's catalogue? Again, it is of little importance to state the exact number of official oleoresins or to give a list of the many preparations of cubebs. The information needed is which of the oleoresins is of permanent value, and whether the beginner, in prescribing cubebs, had better select the oleoresin or the oil.

Knowledge of real value to the student, which might well be given in a manual of prescription-writing, is suggested by the following topics: The relative value of the various preparations; which of them are in constant and growing use; how to choose between them for forming combinations or to suit the patient's needs; general principles of the use of official remedies in preference to old but unofficial ones, on the one hand, and newly introduced drugs or Smith's or Brown's "superior preparations" on the other; the use of alkaloids or synthetic carbon compounds in preference to crude vegetable products. A statement, respecting each valuable drug, of its best solid and liquid preparations for general use might well be added, and also a list of the best diluents, excipients and flavoring agents, with directions for the use of each.

Of the need for a complete, accurate work on this subject there can be but one opinion. The young physician has no more important duty than the correct writing of the best prescriptions he can devise, and everything that enables him to excel in this task is not only an aid in his professional advancement, but is, to his patients, directly health-saving and life-saving.

<div align="right">ANITA NEWCOMB McGEE.</div>

Part I. Essentials of Refraction and the Diseases of the Eye. By EDWARD JACKSON, A. M., M. D., Professor of Diseases of the Eye in the Philadelphia Polyclinic and College for Graduates in Medicine, Member of the American Ophthalmological Society, etc., etc.

Part II. Essentials of Diseases of the Nose and Throat. By E. B. GLEASON, S. B., M. D., Surgeon in Charge of the Nose, Throat and Ear Department of the Northern Dispensary of Philadelphia;

formerly Assistant in the Nose and Throat Dispensary of the Hospital of the University of Pennsylvania, etc., etc. Second Edition Revised; 124 illustrations. (*Philadelphia: W. B. Saunders*, 1894.)

This compend is meant for those postgraduate students who are trying to get a better working knowledge of the diseases of the eye, and to help the general practitioner who is not satisfied with his knowledge of diseases of the eye, but desires to learn how to treat intelligently the most common eye affections and at the same time to recognize the point where the disease demands a specialist's attention. To aid in this direction we think the book is well adapted. The questions are sensibly framed and clearly answered. The chapter on diseases of the conjunctiva is particularly good, but in speaking of the treatment of purulent ophthalmia, we think it would have been well had the author stated just how much of the solution of nitrate of silver should be used at each application, for we know of more than one case where too much zeal in its use in purulent ophthalmia has been followed, it is true, by the disappearance of the ophthalmia, but also by permanently clouded corneæ, from the effects of the chemical. The illustrations, 52 in number, are taken generally from the more complete works on ophthalmology. The author certainly has reason to hope that those who go further in the science of ophthalmology will find in his Essentials "a good foundation for future progress."

The work on diseases of the nose and throat contains all that is of practical value to the postgraduate student. We see no reason why these two subjects, so remote from one another, should be associated as they are in one volume.

Essentials of the Diseases of the Ear. Arranged in the form of Questions and Answers. Prepared especially for Students of Medicine and Postgraduate Students. By E. B. GLEASON, S. B., M. D., Clinical Professor of Otology, Medico-Chirurgical College, Philadelphia. (*Philadelphia: W. B. Saunders*, 1894.)

The author has gotten together in an attractive form practically all that is useful in otology. Text-books on the ear are not satisfactory reading, to say the least, to the general practitioner, but we think the latter will find the "Essentials," generally speaking, free from what is tiresome, and really helpful in his postgraduate work.

BOOKS RECEIVED.

Diseases of the Female Bladder and Urethra. By Howard A. Kelly. Baltimore. Pamphlet.

Transactions of the College of Physicians of Philadelphia. V. 16. 8vo. 287 pages. 1894. Philadelphia.

Heredity, Health and Personal Beauty. By John V. Shoemaker, A. M., M. D. 8vo. 422 pages. 1890. F. A. Davis, Philadelphia.

Essentials of Diseases of the Ear. By E. B. Gleason, S. B., M. D. (Saunders' Question-Compends.) 12mo. 147 pages. 1894. W. B. Saunders, Philadelphia.

Essentials of Diseases of the Eye, Nose and Throat. By Edward Jackson, A. M., M. D., and E. B. Gleason, S. B., M. D. (Saunders' Question-Compends.) 12mo. 290 pages. 2d ed. 1894. W. B. Saunders, Philadelphia.

Two Monographs on Malaria and the Parasites of Malarial Fevers. I. Marchiafava and Bignami. II. Mannaberg. 8vo. 428 pages. 1894. The New Sydenham Society, London.

BULLETIN

OF

THE JOHNS HOPKINS HOSPITAL.

CONTENTS.

THE WRITINGS OF MAURICEAU.

BY HUNTER ROBB, M. D., *Professor of Gynæcology, Western Reserve University, Cleveland, Ohio.*

[*Read before the Johns Hopkins Hospital Historical Society, April 8, 1895.*]

François Mauriceau, Master of Arts, an ancient provost and guard of the company of sworn Master Surgeons of the City of Paris (for these are the titles which follow his name on the first page of his principal work), was born in the year 1637 and died in 1709. The accounts which we have of his life are very meagre, and it is quite possible that had he not lived at a time when the number of illustrious names added to the history of medicine was very small, he would have been almost unknown to posterity. Levret, however, says that Mauriceau "drew from the cradle" the art of midwifery.

In any case, when considering the principal works on mid-wifery and on the diseases of women which appeared during the 17th and 18th centuries, it would seem that his writings could hardly be passed over in silence.

Besides his 283 aphorisms, to some of which I shall refer later, he wrote a work on midwifery which passed through many editions. The title as it appears in an English trans-lation by one Hugh Chamberlen, is as follows : "The Accom-plisht Midwife, treating of the diseases of women with child and in child-bearing, and also the best directions how to help them in natural and unnatural labor, with fit remedies for the several indispositions of newly born babes, illustrated with divers fair figures and very correctly graven in copper. A work much more perfect than any yet extant in English,

being very necessary for all teeming women, as also for phy-sicians."

The edition which I have been reading was published in 1682, but the book appeared first in an incomplete form, as the author himself tells us, in 1668. It is dedicated with a great many stereotyped polite phrases to Antoine Daquin, who was the chief physician of Louis XIV. After the dedication we have the usual page of epigrams, one to the envious critic, another to the jealous ignoramus, both of which are by the author. The third, written by Dulaurens, is in praise of "François Mauriceau, the writer of a most useful book on child-birth."

In the preface the reader is recommended to approach the study of the work in a teachable spirit, for the author says, "As purgatives though excellent in themselves will not profit a body that has not been prepared for them, so he that would instruct those who are not ready to receive instruction." He then goes on to compare the authors who had written on this subject before his time to geographers who have never seen the countries which they describe, and adduces his sixteen years practical experience as a proof that he himself is better as a writer.

Possibly as a sort of bribe to his readers, he promises that in the last part he will reveal all the most profound secrets of the art, and while humbly acknowledging that there may be

some chaff among the wheat, he thinks that those who look for it will find in the book a sufficiency of good grain to reward them for their labors.

The work is divided into three books, which are preceded by an anatomical treatise on the female generative organs.

The first book treats of the different diseases of pregnant women from the time of conception to that of labor; the second book deals with labor itself; the third is devoted to a consideration of the puerperal state, and to the diseases of newly-born infants.

Perhaps the most striking thing about his anatomy is the mistake (which he persists in emphasizing more than once) in calling the ovarian ligaments "the true ejaculatory vessels which go from the testicles to the uterus." The Fallopian tubes also appear in his figures, but he takes pains to describe them as "the vessels which many esteem to be the only true ejaculatory vessels described by Fallopius under the name of tubes, or trumpets."

To the ovaries he ascribes functions analogous to those of the testicles in the male, but he says that they are formed differently, being made up of vesicles "which some moderns concede to be eggs without shells, which, after being fructified by coitus, some days later fall into the uterus."

He especially criticises the views of Graaf and his followers for saying that the human female possesses ova, and adds, "This sentiment ought not to be followed by other wise men for the reasons as well known to them as to me."

He incidentally mentions ovarian cysts and believes them to be due to some congenital malformation of the ovaries.

As I said just now, he believes that the ovarian ligaments are the real vasa deferentia because they go straight from the ovary to the uterus. The fact that they are solid tubes and not canals does not seem to have caused him any difficulty, since he argues that this will not at all prevent the sperm from trickling through. Believing as he did most thoroughly that the female contributes semen as well as the male, and being utterly opposed to the idea of the existence of ova, he could not see how the fluid could pass from the ovaries to the fallopian tubes, "seeing that the two are not connected."

He divides the uterus into four parts, the body, the internal opening, by which he meant the external os, the neck of the uterus or vagina, and the external orifice or vulva.

He corrects the measurements of Galen and other anatomists, and says that the length of the uterus from the vulva is not four but eight inches. He condemns Bartholini for saying that the uterus during pregnancy becomes thicker as well as longer, and quotes Galen and Vesalius to show that the pregnant uterus develops at the expense of the thickness of the walls, just as happens when the bladder expands as it fills with urine.

He did not understand that during pregnancy there is an actual increase in the number of muscular fibres in the uterus. He says that if an ewe be opened in the last days of pregnancy the fœtus can be seen through the transparent walls of the uterus.

In aphorism xxiv Mauriceau states that the vessels in the uterus develop in size during pregnancy. "If this be so," says Boivin, "and if the calibre of the vessels is aug-

mented, why should the walls of the uterus become thinner? As a matter of fact the uterus loses little or nothing in thickness; this is a phenomenon of pregnancy which is most astonishing and admirable. It is true that the uterus can become thin at certain portions, especially those which are in contact with a prominent angle of the pelvis. Many causes may give rise to rupture of the uterus, and the viscus is not always distended in proportion to the size of the child."

Believing that the menstrual fluid was meant to nourish the child, he thought that blood came from pregnant women, whenever the supply to the uterus was more than was required to nourish the fœtus. He accounts in this way for the exceptional instances of menstruation during pregnancy.

He held that the uterus was supplied to a very great extent by the sixth pair of cranial nerves, which also went to the stomach, and thus finds an explanation for the various gastric disturbances occurring in pregnancy.

He bases the signs of virginity on the disposition of the four carunculæ, and says that "the membrane which some describe as lying within and across the vagina, and call the hymen," is pathological. He ridicules the idea that it is always possible to tell for certain as to the virginity of a woman, and quotes in support of his position certain verses from Proverbs, chapter xxx, interpreting them perhaps correctly, but upon this point I must plead ignorance.

He had evidently dissected animals, since he describes the uterus of some as containing several different cavities. Aphorism xx says "the uterus of a woman possesses only one cavity, and is different from that of most other animals, in which this organ possesses several small cells." Boivin's footnote is as follows: "Several cases of double uterus in women have been reported; I saw at an autopsy of a newly-born female infant a double uterus; each uterus possessed an orifice corresponding to a separate vagina; these two vaginæ ran together and terminated in separate orifices at the inferior commissure of the vulva; the same infant had several supernumerary fingers and toes."

The semen of a woman he holds to be an extract of the purest arterial blood elaborated in the ovary and containing a quintessence of all the parts of the body. He is highly indignant with those who deem the semen an excrement, when in reality it is the "master fluid of the body."

On generation he says, "Sperm from the male and female is necessary for generation, and both secretions must be prolific, that is, they must contain the idea and form of all parts of the body."

Aphorism lxiv says, "Sterility is usually due to some imperfection in the woman; for thirty sterile women one sees only one sterile male."

In speaking of sterility he lays much stress upon atresia as a cause of this condition, and recommends operation if constitutional measures are not successful.

He considers birth-marks to be due to some malformation in the blood-vessels, and ridicules the idea that the so-called strawberry marks are caused by drinking red wine during pregnancy, since "it is well known," he says, "that such things are seen in countries where nothing but white wine is taken."

He mentions an interesting case of a pregnant woman who nursed a child who had smallpox and afterwards bore an infant who had also the marks of smallpox. He fails to explain this phenomenon satisfactorily, but does not believe that it was simply due to mental emotion on the part of the mother.

Speaking of the signs of conception, he considers a slight pain in the region of the navel as of importance, and thinks that it is caused by tension upon the urachus.

The flattening of the abdomen in the first few weeks of pregnancy he attributes to the loss of flesh at this time.

He maintains that dropsy, although it may be mistaken for pregnancy, does not necessarily exclude the latter condition, and quotes the case of a woman who had dropsy for nine years and yet bore four children during this time. He speaks of the "incomparable science" of Democritus, who, judging only from the expression of the face, on one day saluted a girl as virgin and on the next day as woman, not knowing that in the interval she had been seduced; but later on he modifies this expression and says that it was probably more of a lucky hit on the part of Democritus than a scientific diagnosis.

He questions the statement of Hippocrates that while the male child is fully formed at the end of thirty days, in the case of a female child forty-two days are necessary, and thinks that both sexes receive a perfect form within the same period of time.

In aphorism lxxviii he says that "the whole body of the fœtus is formed from the first day of conception, and is then not larger than a millet seed; the remaining time of pregnancy serves only to give it the necessary growth."

He does not agree with Aristotle, who says "that the heart is formed first, but rather with Hippocrates, who says that no starting-point can be distinguished in the fœtus any more than in a circle which has no beginning."

He criticises Tertullian, who thought that the soul was evolved from certain essences in the semen, and, like a good churchman, believes that "the soul comes from without, and is fixed in the body of the child after it is fully formed."

The question of extra-uterine pregnancy gives him another opportunity for inveighing against Graaf and Fallopius. He gives an account of a case which was reported by a surgeon named Vassal. He claims to have made a drawing of the fresh specimen, asserting that the one usually accepted was made a month later, when the parts were much decomposed and mutilated by handling. According to his account the case was strictly speaking not one of extra-uterine pregnancy, but the fœtus had developed in a part of the uterus which had bulged out at the side, forming a kind of hernia. The picture which he gives would seem to favor his view if we could be quite sure that the round ligament was in the position in which he represents it to be (Fig. II).

Naturally on the subject of tubal pregnancy we should feel more inclined to take the views of men who knew which were the real tubes, and as we have said, on this point Mauriceau was not only mistaken, but has taken great pains to make it quite clear to us that he was in error.

In aphorism xxi he refers to this again. "The generation of the infant can very well take place near one of the corners of the uterus where the ejaculatory vas deferens called the tuba joins it, but it is impossible that generation should take place in the vessel itself." Boivin's note is as follows: "Proofs are not wanting that pregnancy has taken place both in the tube referred to by Mauriceau and in the ovary, and that the infant has developed there."

He gives various signs for diagnosing the sex of the fœtus in utero, but concludes that it is impossible to make a certain diagnosis. On this point he refers to several old superstitions, such as the one which taught that if conception takes place with the waxing of the moon a male child is engendered, whereas from a conception when the moon is waning a female child is to be expected.

He thinks that we can be more certain as to the number of children which a woman will probably bear at one time. Although he says that four is generally the limit, he reports many instances in which more were born at one birth, and until the number reaches fifteen he seems to think that such records are just within the bounds of possibility. But when he arrives at the history of a certain dame Marguerite, Countess of Holland, "who in the year 1276 was brought to bed of three hundred and sixty-five infants at one and the same time, who all received baptism and died on the same day together with their mother," he confesses, and not without reason, that we have reached the domain of fable.

He defines superfœtation as a "reiterated conception," and holds that this, as a rule, is impossible, "because after the first conception the mouth of the uterus is closed entirely and will not receive the semen of the male; yet exceptions may occur after the sixth day, but not before, since the first conception is not complete until after this period of time has passed; then, however, if the woman during coitus be intensely excited the cervix may open and the semen again enter the uterus."

He holds that twins as a rule are not instances of superfœtation, since they are born about the same time, and must therefore have been conceived about the same time.

The fifteenth aphorism is curious. "One sometimes sees weak and infirm women produce fairly healthy children, because the infant has in itself a peculiar principle of life which often purifies the nourishment which it receives from the mother, just as we see that the graft rectifies and renders milder the austerity of the sap of the wild tree on which it is grafted."

For the production of moles he holds the corruption of the sperm either of the male or female to be responsible, but he says that those occurring in unmarried women are not genuine moles.

In speaking of the so-called gaseous moles he seems to think that they are instances of physometra. For the differential diagnosis he gives us numerous points. (1) a mole has no active movement but is strictly passive; (2) on feeling the abdomen when the uterus contains a mole it will be found harder but more tender, and increases in size rapidly; (3) a mole being a dead weight is more trouble to carry than a living fœtus; (4) the bladder is more compressed, the evacuations are not so much increased and these contain deposits; (5) scirrhous growths and the menstrual flow are expelled in the case of moles; (6) when a woman is near term the

second or third month it is called a false germ; these false
germs are membranous, while moles are fleshy; (7) the move-
ment of a mole is only like that of a dead weight in the abdo-
men; (8) a mole does not come from the uterus at term,
although it is possible for a pregnant woman to have at the
same time a mole in the uterus.

Aphorism lxvii says "the generation of a false germ in a
woman previously sterile is generally a sign that she will be
fruitful." Boivin adds, "the false germ or mole being the
result of a degenerated conception, nothing is more certain
than that the woman is apt to conceive."

His rules for the care of pregnant women are principally
hygienic, although some of us might be inclined to think it
rather severe that the pregnant woman should not be allowed
to take a bath.

In aphorism xiii he expresses an opinion which has often
been disputed, but with which, with certain modifications, the
best authorities now agree: "Cinchona can be given with as
much safety for the cure of fever to pregnant women as to
other persons."

In aphorism viii he says that any serious operation like
that belonging to a stone in the bladder and other serious
conditions should never be performed upon a pregnant
woman. To this statement Boivin makes an exception. "A
stone in the bladder, if voluminous, could on the one hand
interfere with the progress of the head and irritate and tear
the bladder, and on the other hand might occasion inflamma-
tion of the uterus and cause the woman intense pain. It is
better therefore to extract the stone before labor comes on."

He gives an interesting story of a tremor in the hands of an
infant whose mother received a fright during her pregnancy;
the baby was born prematurely and had a peculiar tremor of
the hands, but otherwise was perfectly healthy; he grew up,
and in due time he married; when signing the marriage con-
tract some of the bystanders noticed that his hands shook very
much, and not knowing of his infirmity they conjectured that
"he felt nervous lest he should be making an unfortunate
bargain."

He starts out by saying that the pregnant woman should
not be bled, but modifies this statement in subsequent chap-
ters, although he makes a great point of the fact that contrary
to the prevailing opinion it is much safer to bleed in the
earlier months of pregnancy than when it is far advanced.

The vomiting during pregnancy he looks upon in most
cases as reflex in origin, and recommends only simple remedies
unless it persists for a long time, when he thinks that it must
be caused by morbid material adhering to the coats of the
stomach, which should be removed by laxatives after the
woman has been bled.

He deprecates the use of strong purgatives for fear of abor-
tion. In speaking of vesical disturbances he seems to recog-
nize the frequency of pseudo-incontinence, since after trying
simple remedies he employs the catheter. Were it not that he
looks upon the menstrual fluid as a source of nourishment for
the fœtus, and consequently explains hemorrhages from the
uterus and other parts of the body as being due to the fact
that more blood is brought to the parts than the fœtus needs
for its nutrition, his remarks on the subject of varicose veins

and hemorrhoids, which he attributes generally to stasis in the
veins caused by obstruction, are excellent.

He distinguishes three kinds of diarrhœa, (1) lienteric flux,
(2) diarrhœic flux, (3) dysenteric flux, and says that any severe
attack may induce an abortion.

He recognizes severe hemorrhage as a sign of impending
abortion, but notes that in some cases the menstrual flow appears
during pregnancy without any bad results. He thinks that
when it appears in the first months it is usually caused by some
false germ of which the uterus is trying to rid itself, but that
when it appears in the later months it is probably due to
partial separation of the placenta.

Unless the bleeding is excessive he would leave nature to
take its course, but if there are signs of convulsions or syncope
he insists that labor must be brought on artificially, "other-
wise the woman will breathe out her last breath together with
the blood."

He tells us a sad story of the death of his own sister, which
he says "is still so vivid that the ink with which I write it
to make it known in order that the recital may profit the public,
seems to be blood."

He then cites several cases in which, by turning and imme-
diate delivery, the lives of several patients who were having
severe hemorrhages were saved.

He holds that dropsy of the uterus occurs in general abdom-
inal ascites by the passage of the water through the porous
substance of the membranes of the uterus, and that water is
engendered in the uterus itself when it is debilitated by cold,
violent labor, or by suppression of the discharges. To differ-
entiate such a dropsical condition from pregnancy, he tells us
that in the former the breasts will not be swollen and will con-
tain no milk; no fœtal movements will be remarked at the
proper time; the abdomen is generally distended; the color of
the face will usually be bad; "these dropsies occur principally
in sterile women, although it is possible for pregnancy to be
accompanied by dropsy." He says, "When such women lose
a quantity of water from the uterus it must not be mistaken
for amniotic fluid, since the membranes will be found later to
be unruptured."

He seems to use the term inflammation in the case of par-
turient women as synonymous with erysipelas; in fact he sub-
stitutes the word "inflammation" for erysipelas when quoting
one of the aphorisms of Hippocrates.

It seems to have been a popular notion that a pregnant
woman suffering from syphilis could not be treated for the
disease until after the child was born. To this idea Mauriceau
was strongly opposed, and quotes instances to prove that such
cures had been effected, and that the only indication in such
cases was not to carry the treatment beyond a mild salivation.

In speaking of the premature discharge of the fœtus from the
uterus he makes four divisions: (1) effluxion, that is, the
discharge of the contents of the uterus within six days after
fruitful coitus, when the sperm had attained no consist-
ence; (2) expulsion of the false germ up to the second
month; (3) abortion, a discharge of the perfectly formed
fœtus up to the beginning of the seventh month; (4) prema-
ture labor. "Whenever the fœtus is expelled after the begin-
ning of the seventh month it is a labor."

Among the other causes of abortion he puts the various acute diseases.

In the second book he treats of normal and abnormal labor. Four conditions are mentioned as requisite to make a normal labor: (1) the birth must be at term; (2) it must occur without any particular difficulty; (3) the infant must be born alive; (4) the presentation must be favorable.

With respect to a normal presentation as described by Mauriceau, Boivin says "the head does not take this situation, that is, with the face looking downwards, except in the case of a third occipital presentation or at the end of the first stage of labor; but in the time of Mauriceau and for some time afterwards the mechanism of normal labor was still unknown, so that a presentation of the head was considered bad in which the face was not downwards."

He corrects the erroneous opinion held by Hippocrates that an infant born at eight months was likely to be more feeble than one born at seven months. This opinion was founded upon the idea that it was necessary for the infant to make efforts in order to be born, and that these efforts were first made at the end of the seventh month, so that if the infant did not succeed in escaping from the uterus he was necessarily enfeebled by his futile efforts.

Mauriceau explains that the uterus is the active and the fœtus merely the passive agent in the act of labor. In support of his views he refers to a book written by one Bonaventure, which he says is larger than the Bible and is entirely devoted to the proof of this one point.

The figures in his table of statistics, of which there are three, given to show the duration of the natural pregnancy, vary a great deal. According to these, gestation may last for eleven months and six days. He does not attempt to answer the medico-legal question as to how late a child may be born after the death of its father and still be considered legitimate.

In aphorism lxxxvi he says "pregnancy rarely goes beyond the tenth month; scarcely one out of a thousand of children born at the end of seven months survive; but half of those born at the end of eight months do well, if carefully nursed."

Aphorism lxxxiii says: "Some pregnant women feel fœtal movements after the end of the first month; many others do not feel them before the end of six weeks or two months; others again, only after four months." To this extraordinary statement Boivin objects that the smallness and the consistence that the embryo possesses at the end of a month and the quantity of water by which it is surrounded would render its movements imperceptible to the mother, and even at a later period she could very well confound the movements of the intestines with those of the infant.

He devotes a great deal of space to discussing the question whether the pubic bones separate during the act of labor, and throws discredit on the case of the celebrated Ambroise Paré, who at an autopsy upon a woman who was hung a short time after labor had found the bones separated to the extent of a finger's breadth.

In proof of his position he says: " If such a separation did take place the woman could not stand up immediately after labor," and incidentally we learn that his hospital patients were made to walk from the lying-in room to their bedrooms immediately after delivery.

The difficulty experienced by elderly women in their first labor he rightly attributes not so much to the want of yielding of the pubic joint, but rather to the ossification of the joints between the sacrum and the coccyx.

He distinguishes between false and true labor pains, and mentions the dilatation of the os and the bulging of the membranes as a sign of approaching labor.

He understood the nature and dangers of cases of placenta prævia. He holds that those who would make three membranes, the chorion, the amnion, and the allantois, are mistaken, since there are in reality only two, and these are really separated only with difficulty, the allantois being never seen in the human fœtus.

He regards the idea that an infant born in a caul is lucky as a mere superstition, except from the fact that the labor must necessarily have been an easy one.

It had been held by many authors that the waters were composed of the urine coming from the bladder by the urachus; but this Mauriceau says cannot be, since the urachus in the fœtus is not pervious. He quotes a noted anatomist named Gayant as a supporter of his own view. He holds that the waters are necessarily an exudation from the membranes, since they occur also in the case of false germs.

He evidently understood the uses of the amniotic fluid and denies that it serves as a nourishment of the child, as also the statement of Hippocrates that the infant sucks by the mouth its nourishment from the uterus. In support of this he quotes Aristotle, and shows besides that the waters have no nutritious qualities.

He gives a very good figure showing the placenta and umbilical vessels of the fœtus (Fig. III). He understood, apparently, that the blood from the vessels of the mother did not pass directly to those of the fœtus, and says that any severe indisposition on the part of the pregnant woman can give rise to pathological appearances in the placenta. That the knots in the cord signified the number of children to be born hereafter he declares to be a simple superstition.

In three figures he presents the different natural situations of the infant in the uterus when labor is to be normal. "The infant changes his position in the uterus during pregnancy. Towards the end of the seventh or eighth month the head, which heretofore has been above, takes up its position below, the fœtus having made a sort of a somersault. This perhaps accounts for the idea of some authors that the fœtus attempts to leave the uterus at the end of the seventh month."

He is opposed to the idea that women approaching term should take much exercise, and more especially condemns the advice of Liebaut that they should go driving or ride a saddle-horse at a brisk trot, considering that such exercises, even when they do not cause miscarriage, are possibly the malpositions.

He adds that baths are dangerous, not only on account of their too great humidity but also on account of the excitement which they cause, and which may lead the mouth of the womb to open.

His directions for the conduct of a normal labor are on the whole excellent except those relating to the delivery of the placenta. They are about as follows: "When the symptoms of labor appear the rectum and bladder should be emptied. In strong women blood-letting may be practiced. An internal examination should be made from time to time in order to follow the dilatation of the os, and the genitals should be anointed with some emollient oil. Too many examinations should not be made. The woman should not be allowed to lie down too long in the first stage. Vomiting is not a dangerous symptom. The membranes should not be ruptured too soon. Many midwives, for fear of displaying ignorance, will not send for a surgeon sufficiently soon, and prejudice the poor women against them, calling them butchers and executioners."

"The woman should be allowed to choose her own posture for the second stage of labor. A feather-bed should not be used, and arrangements should be made to prevent the soiling of the bed-linen. Pressure on the abdomen should not be employed, though the os may be gently dilated by means of the fingers. No violence should be used in pulling upon the head, and direct traction should not be made, but rather a rocking motion from side to side."

"After the child has been born it is necessary to first see that there does not remain a second fœtus in the uterus. Even before tying or cutting the cord the placenta must be delivered. To do this, the midwife, taking two or three loops of the cord around the two fingers of her left hand and advancing the right hand near the vulva, makes gentle traction on the cord. Too strong traction must not be employed for fear of breaking the cord, in which case there may be a dangerous hemorrhage. Meantime the woman should be told to blow hard into one of her closed fists, or should put her finger down her throat in order to excite vomiting. A competent nurse may at the same time press lightly with the flat of her hand on the abdomen, employing friction. If these measures do not succeed, the hand must be introduced into the uterus and the placenta seized and taken away. Care should be taken not to leave any part of the placenta, any clots of blood or any false germs in the uterus. In the case of twins the placenta of the first should not be delivered before the second is born." The false germs would of course be remnants of the placenta, although Mauriceau says particularly that he has seen false germs discharged after the placenta has been delivered entire.

It is possible that he had often seen rupture of the cord following this method, since he devotes a chapter to the method of manual separation of the placenta after the cord had been broken.

He advises against the use of powerful drugs by the mouth to assist the expulsion of the placenta, and prefers extraction by the hand. He recognizes the necessity of bringing away all the membranes.

Besides normal labor he recognized three grades, (1) laborious or tedious labor, (2) difficult labor which is accompanied by certain complications, (3) abnormal labor, which is due to some malposition of the fœtus.

Of the last named he makes four main divisions, (1) when the anterior part of the body presents, (2) when the posterior part of the body presents, (3) when the lateral part of the body presents, (4) foot presentations.

He devotes a good deal of space to the description of the physical and moral character of the good obstetrician.

In speaking of the question as to whether the foetus in utero is still alive, he says that all the signs must be taken into consideration together, since each by itself is equivocal; the most trustworthy, however, being the recognition of (1) movements, (2) pulsation in the umbilical vessels or in the radial artery.

He is unwilling to allow the use of the hook by the midwife. He seems to have understood very well the operation of internal turning. Boivin says that his ideas on the subject were not original but had been described by Louyse Bourgeois. The forceps was unknown in Mauriceau's time.

In convulsions which are not easily controlled he recommends the induction of labor, and digresses to tell a story in which the operation was indicated but was performed too late to be of any service to the woman because the two priests who were present spent a whole day in discussing the question as to whether or no the baptism of the fœtus in utero was sanctioned by the church.

"Some authors," he says, "in foot presentations recommend turning on the head, but can tell us of no easy way of effecting this." He uses the hook in the extraction of the dead fœtus, and recommends if necessary the reduction in size of the head or body by means of a curved knife.

He devotes a whole chapter to the condemnation of Caesarean section on the living woman, and says that it is always fatal. He explains away cases of reported success by saying that they exist only in the imagination of the authors.

Caesarean section on the dead woman he considers not only lawful but necessary, and prefers to make a median and not the lateral incision recommended by many other authors.

Boivin, remarking on the aphorism which forbids Caesarean section on the living woman, says "this operation has rarely been successful; nevertheless, since it has succeeded sometimes, one should try this method of saving the mother and infant when no more certain means present themselves."

In Book iii he speaks of the care of the parturient woman and of the new-born babe. He forbids all tight bandaging and nauseating medicines, but allows a comfortable bandage and a light but nutritious diet. He warns us not to allow the woman to partake of the various delicacies which are usually prepared for the collation at the baptism of the infant.

He considers it a superstition that the wearing of the husband's shirt will produce the drying up of the milk. About post-partum hemorrhage, beyond recommending perfect rest (unless it be due to the presence of fæces in the bowel, in which case enemata should be given) he has not much to say.

He gives pictures of pessaries to support the prolapsed uterus after it has been put back into position. He himself preferred the ring pessary. He recognizes the error of Rousset, who would have us introduce the pessary into the cavity of the uterus itself, and adds: "This absurdity of Rousset, which he backs up with ridiculous arguments as if it was an interesting fact, would lead us to believe that he allowed himself to be deceived in the majority of fabulous stories which he puts down in the same book respecting Cæsarean section."

Fᶜⁱˢ MAURICEAU
(Chirurgien),

Tab. 8
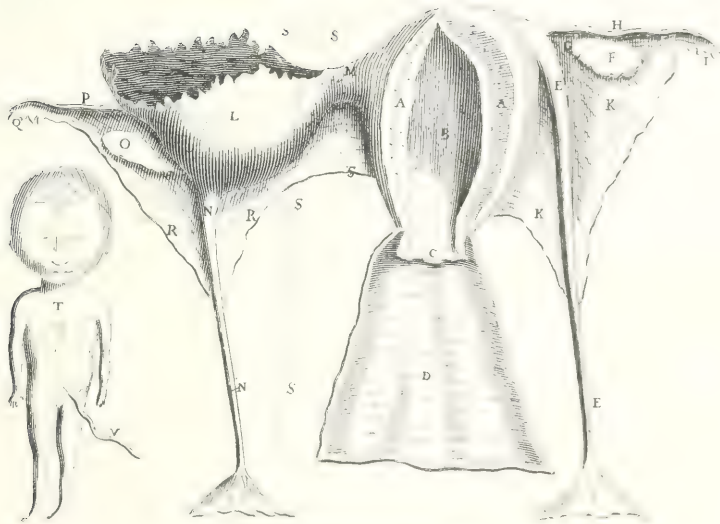
No. 2. Extra-uterine Pregnancy.

Fig. 1   Fig. 2   Tab. 9

Fig. 3
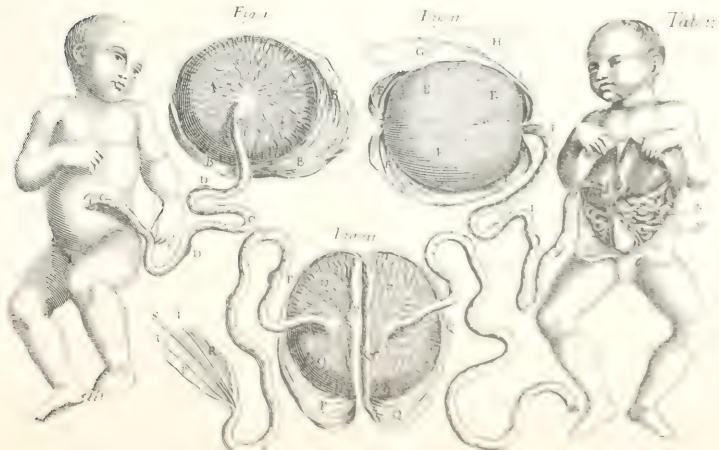
He speaks of prolapse of the rectum as sometimes occurring during labor.

He recommends the suturing of ruptures of the perineum at once, but speaks also of a later operation when it is necessary to freshen up the cicatricial tissues by means of the scissors or bistoury.

After-pains, he thinks, are due to gas in the intestines or to the presence of some foreign body, it may be a kind of false germ, a portion of the placenta, or clots of blood remaining in the uterus, or finally, by the sudden suppression of the lochia or by the overstretching of the ligaments.

Boivin notes that in speaking of the suppression of the lochia as placing a woman's life in danger, Mauriceau has mistaken the effect for the cause.

He recommends a good warm bouillon instead of the nauseating oil which was usually given in such cases. "Some midwives, under these conditions, give the woman a few drops of blood taken from the placenta; this is a mere superstition."

He also recommends hot fomentations and, above all, the removal of the foreign body if any be present in the uterus.

He seems to understand the nature of the lochia and gives a more or less correct account of the reasons for the change in color which occurs. He says that those who believe that the lochia consists of the milk of the breasts are ignorant of their anatomy, "since they should know that there is no channel which connects the mammæ directly with the uterus, unless indeed they suppose that it comes through the mammary vein which is supposed to unite with the epigastric vein, whereas as a matter of fact the epigastric vein does not connect with the uterus at all."

He understood that after the detachment of the placenta there was left a wound in the uterus which must have time to heal.

The sudden suppression of the lochia he says is very prejudicial to the woman. He seems to think, however, that it is often followed, and not rather preceded, by an inflammation of the uterus. He prefers bleeding from the arm to bleeding from the foot on these occasions.

He believes that scirrhus causes trouble by blocking up the uterus and preventing the passage of the normal excretions. He adds that a scirrhus can turn into a cancer and then become very painful.

"Cancer of the uterus is incurable because it cannot be taken away like a cancer of the breast. Cancer of the vulva can be cured by salivation, but when the growths are once in the uterus the treatment is of no avail." He probably mistook venereal for carcinomatous ulcers.

He understood that bad cow's milk was provocative of disease. He describes single and multiple abscess of the mammary glands, and gives pictures of nipple shields and general instruction about the nature and treatment of sore and retracted nipples. He condemns the custom of pressing back the blood from the cord into the infant's belly, since the blood, far from enriching that of the infant, is more liable to produce suffocation, since it is not vivified. He advises the placing of a compress over the fontanelle for several months.

His remarks upon the nursing of infants are excellent, except that he insists more than once that a mother should not be allowed to nurse her child for the first five or six days after birth.

He treats of the various diseases of young children in a very sensible way, and the chapters on indigestion, aphthæ, teething, chafing, and the venereal diseases are excellent and show the soundest common sense and good practice.

He had the right ideas about the occurrence of syphilis in infants, whether congenital or acquired, although we must differ with him when he says that a syphilitic woman should not be allowed to suckle her own child who is already syphilitic, but that a new nurse should be obtained, "although she is very apt to acquire the disease from the infant." This doctrine would seem very much in contradiction of that which he promulgated before, namely, that a woman's life is of more importance than that of a young child; and if her life, why not her health?

He closes with a chapter on the rules to be observed in selecting a wet nurse. Throughout the whole book he shows an intelligent conservatism. He shows that he must have possessed the power of observation and was not afraid to act when occasion demanded it.

A criticism of his aphorisms is also found in Levret's works.

From his writings we may picture to ourselves an honest, upright man, who, if not particularly brilliant, could safely be entrusted with the care of difficult cases, and who never allowed his common sense to be obscured by the various superstitions which prevailed in his time, by the greed for gain, or by the gratification of his personal vanity.

JOURNALS, ETC., ISSUED BY THE JOHNS HOPKINS PRESS OF BALTIMORE.

THE PSYCHOLOGIC DEVELOPMENT OF MEDICINE.

By J. H. McCormick, M. D., *Washington, D. C.*

[*Abstract of paper read before the Johns Hopkins Hospital Historical Club, April 8th*, 1895.]

[A preliminary discussion of the independent evolution of culture concepts and the acquisition of a culture status by primitive peoples through mental evolution rather than by contact with other peoples, is omitted as of anthropological rather than medical interest.]

In the development or evolution of medicine, four stages are traversed—Imputation; Personification; Reification; and Scientific Explanation. By imputation is meant attributing to things powers and properties they do not possess. Personification is when these attributes are deified or personified. Reification is the designation of that stage in which these attributes are reified or made real; while in the last an attempt is made to give the true or scientific explanation. In proportion as the degree of culture advances we find medicine ascending from the lower to the higher of these stages, so that culture development is but a history of the healing art from empiricism based upon imputation, to scientific or rational medicine.

Among all primitive people everything is symbolic; their words and thoughts are expressed in symbols, and the unknown is expressed in terms of the known by this means; symbolism pervades everything everywhere. Since all practice is based originally upon some preconceived theory, and is the practical application of such theory, the history of medicine is the evolution of the mental conception of the cause of disease and of the action of the various agencies which govern or modify it.

How do primitive people formulate their theories? By observing nature in all of her protean forms and infinite variety. They are close students of nature and of natural phenomena, but are unable to see beneath the surface and, beholding that which is far beyond them, attribute it to some supernatural, some divine being who shifts the scenes and causes the changes of day and night to follow one after another.

Thus unknown forces and phenomena are ascribed to more powerful beings than themselves, having powers and attributes similar to their own but in a magnified degree. The mysterious movements of nature are operated and controlled by these supernatural personages, and hence are attributed to causes which do not exist. This is imputation.

To illustrate: the North American Indian believes the breath to be the spirit or soul, and this is how he arrives at such a conclusion.

On a cold frosty day the warm breath as it leaves the mouth is condensed by the cold air, forming a slightly visible cloud, and he observes that all living animals, both man and beast, emit this cloud, and that when dead this phenomenon does not occur, therefore he reasons this must be the spirit of life, and its absence denotes death. Again, he hears the thunder, and attempts to find in the living objects around something like it. He perceives that the growl of the bear somewhat resembles the noise of the thunder, therefore a great bear must have made the thunder, and what he hears is this animal growling in the heavens. When the breath is blown upon the hand a slight force or pressure is felt, and as a result, when the winds begin to blow it is but the bear-god sending forth his breath; if gentle, it is a life-giving, beneficent breath; if strong or forceful, it is an angry, death-dealing, destructive breath, showing that the sky-bear is filled with rage. The clouds are but the prototype of the breath of man, only being so much greater they must have come from the bear-god, who can render himself invisible.

This is imputation, in that he attributes to the bear the power of thundering and causing winds; conversely, when he hears the thunder he reasons that the bear causes it.

In time he notes that when it thunders a storm is about to break, cold, wind and rain follow, and the hunter becomes wet and cold, and from consequent fatigue and exposure takes cold; chills and fever, rheumatism and other diseases follow. This is the bear disease—for did not the bear cause it? For some reason, it may be, he has angered the wind-god or the rain-god, and thus their displeasure is visited upon him. To propitiate by prayers, gifts, sacrifices and the performance of ritualistic ceremonies is his chief hope of relief.

We will now consider the evolution of medicine as it has actually existed from the beginning to the present time, taking the four stages in order of their occurrence. It must be remembered, however, that while one particular stage predominated at any given time, even at first some degree of all was present, just the same as now.

IMPUTATION.

Let us first endeavor to ascertain what was early man's conception of disease; for upon such conception depended his method of treatment; and in passing, attention is called to the fact that the same ideas, fundamentally, are found in every quarter of the globe, thus giving positive evidence in support of the statements and assertions made in the proposition which it is the province of this paper to demonstrate.

" Man," says Tylor, " as yet in a low intellectual condition, having come to associate in thought those things which he found by experience to be connected in fact, proceeded erroneously to invert this action, and to conclude that association in thought must involve similar connection in reality."

There are certain physiological functions, such as digestion and elimination of excretions, upon which the body depends for its existence, and when these are disturbed they give rise to pain or discomfort; and not knowing that such a departure from his normal condition is due to perversion of function, early man connects it with some mysterious power, a malevolent spirit.

After he has witnessed death and has recovered from the shock occasioned thereby, he seeks to find a reason for this sudden loss of energy and animation, and the failure to respond

to the demands made upon the one who was recently full of life and vigor.

Thus disease and death were caused by anger of offended external spirit, by supernatural powers of a human enemy, or by displeasure of the dead.

In India, Africa, China, the Pacific Isles and among the North American Indians, no natural death was recognized, but poison or witchcraft was the means by which all were removed.

The most powerful cause was the anger of the offended spirit. It has been already shown that the conception of the spirit or god is the natural sequence of the observation of natural phenomena; this idea is universal and forms one of the strongest proofs in support of the proposition to be demonstrated.

The septenary system of the Hindoo philosophy, so well described by Rhys-Davids, has its exact counterpart in the religious scheme of the North American aborigines. The vast collection of swastica made by Prof. Thos. Wilson shows the universality of this idea of the cross based upon the cardinal points of the compass, and is the result of a psychologic process.

The sun rises in the east and sets in the west. In front was the north, behind the south, above the sky, beneath the earth, and the centre around which all revolved was the abode of man. Can you not recognize the analogy to the ancient conception of astronomy in this?

If an east wind blew, the sickness was caused by the god of the east wind; if a man was sunstruck, the god of the south was enraged; if from the west or north, a like god was the cause. Propitiations and sacrifices followed as a logical result and were based upon their various beliefs relative thereto. The old method of punishment, found everywhere, of quartering the body had its origin in the offerings to the gods of the four ends of the world, and from this came the method of crucifixion, in vogue in many parts of the world.

In Lien-chow, province of Kway-oi, if a man strikes his foot against a stone and then falls sick, his family know it was a demon and offer wine, rice, fruit, incense and worship. Recovery follows.

Supernatural Power of Human Enemies.—Witchcraft, sorcery, practice of magic, voodooism and kindred practices are the imputed means by which an enemy inflicts disease upon his unwary victim.

Witches and wizards have exercised their uncanny and occult powers from time immemorial—a belief surviving among the negroes of our own Southern States, to say nothing of the Indians. In New England even, the practice of charging persons with being witches existed not much more than two centuries ago, and need not be here discussed.

I knew an old negro suffering from vertigo who declared it to have been caused by a witch, and an old woman with a large goitre which she claimed was due to the poisoning of a spring from which she drank. She thought the poison was placed in the spring by an old witch and was only toxic to her, because any one else could drink with impunity.

Displeasure of the dead was a fruitful source of disease. Ghosts, spooks, wraiths and unlaid spirits came back and,

invested with power from the spirit-world, worked mischief upon those whom they thought had injured them in life. The mythology and folklore of every country and every age have teemed with legends of all these agencies.

PERSONIFICATION.

The transition from the stage just described to Personification is so gradual that no line of demarcation can be drawn. In the former the various natural phenomena were given as the cause of disease; in this, these agencies are deified or demonized.

"Sickness may be caused by invisible spirits inflicting invisible wounds with invisible spears, or entering men's bodies and driving them raving mad." Tylor, in his *Primitive Culture*, says: "As in normal condition, the man's soul inhabiting his body is held to give it life, to think, speak and act through it, so an adaptation of the self-same principle explains almost all conditions of body or mind by considering the new symptoms as due to the operation of a second soul-like being, a strange spirit." "The possessed man, tossed and shaken in fever as though some live creature were tearing and twisting him within, rationally finds a spiritual cause for his suffering and a name for it which it can declare when it speaks in its own voice and character through his organs of speech" (Vol. II, pp. 113-116).

This is widespread, for we find in China, Australia and North America, stones possessed by demons; and it is this spirit of evil and mischief, not the stone, which inflicts the injury. Among the Dyaks of Borneo, and in Cambodia, illness is due to the tormenting demon, while in Australia smallpox is caused by a black deformed demon. Woutan of Scandinavian mythology both causes severe illness and pestilence as well as cures them.

Assyrians and New Zealanders both believed in a demon for each part of the body.

In Ceylon the demon of disease was the son of a powerful king, whose wife, proving faithless to him, was ordered cut in twain, one part to be thrown to the dogs and one part to be hung in a tree. Before execution the queen said, "If this charge be false, may the child in my womb be born this instant a demon, and may that demon destroy the whole city and its unjust king." Nevertheless she was executed, but the severed parts immediately united and the child was born, and it went to feed upon the carcasses in the graveyard, and after a time brought disease upon the city.

The Israelites believed disease and death to be due to a destroying angel.

"Disease is still represented as evil influence to be exorcised. In the popular minds disease walks the earth as a devouring fiend and has a personality about it as of old. Our very phrases 'stricken with disease,' 'visitations and seizures,' are survivals of the conceptions of primitive times."

Among the Rosicrucians, disease was provoked by a spirit imprisoned in crystal. The natives of southwest Australia venerate pieces of crystal called "Teyl," which no sorcerer is allowed to touch, as it would cause the spirit to depart. Capt. Gray notices the accordance of this word in sound and signification with the "Barzel" as recorded in Ezek.

antiquity, mentioned by Burder in his *Oriental Customs.* These stones were rounded and were supposed to be animated, by means of an incantation, by a portion of the deity. Magicians were supposed to be possessed with a power given them from the gods; in Syria the Witch of Endor (1100 B. C.) claimed to hold conferences with the dead.

In Hellas Ulysses visited the spirit-world, and men were turned into swine (400 B. C.).

In the consideration of the foregoing subdivisions, no treatment of disease in detail has been given, because the method of both was by imputation, and the consideration of special cases, as illustrations and corroborative testimony, will be more striking and better followed when the two are combined.

All treatment fell under three heads, dynamic or empiric, thaumaturgic or magical, and theurgic or by divine agency, and sometimes one method alone was used, but more frequently all three were combined in a single case. Usually they believed the efficacy of the drug to be due to some magic rite or formula which had to be performed or recited before the material was ready for use, and this principle did not exist at all in the agency to be employed, or was at least latent and the ceremony was necessary to implant it or render it active.

This is well shown by the customs of the Cherokees in gathering herbs for medicinal use. "The shaman goes provided with a number of white and red beads, and approaches the plant from a certain direction, going round it from' right to left one or four times, reciting certain prayers the while. He then pulls up the plant by the roots and drops one of the beads into the hole and covers it up with the loose earth. In one of the formulas for hunting the ginseng the hunter addresses the mountain as the 'great man' and assures it that he comes only to take a small piece of flesh (the ginseng) from its side, so that it seems probable that the bead is intended as a compensation to the earth for the plant thus torn from her bosom. In some cases the doctor must pass by the first three plants met until he comes to the fourth, which he takes and may then return for the others. The bark is always taken from the east side of the tree, and when the root or branch is used it must also be one which runs out toward the east, the'reason given being that these have imbibed more medical potency from the rays of the sun.

When the roots, herbs and barks which enter into the prescription have been thus gathered, the doctor ties them up into a convenient package, which he takes to a running stream and casts into the water with appropriate prayers. Should the package float, as it generally does, he accepts the fact as an omen that his treatment will be successful. On the other hand, should it sink he concludes that some part of the preceding ceremony has been improperly carried out and at once sets about procuring a new package, going over the whole performance from the beginning.

Herb-gathering by moonlight, so important a feature in European folk-medicine, seems to be no part of the Cherokee ceremonial. There are fixed regulations in regard to the preparing of the decoction, the care of the medicine during the continuance of the treatment, and the disposal of what remains after the treatment is at an end. Pretenders endeavor to impose upon the ignorance of their fellows by posing as

doctors, although knowing next to nothing of the prayers and ceremonies without which there can be no virtue in the application."

Among the Chinese panax quinquefolia or ginseng is given to ward off or remove fatigue, invigorate the feeble, restore exhausted animal power, to make the old young—in short, to render man immortal. It is found in the mountains of Shantung and Leotung, but now most of it is imported from this country.

Its very name, ginseng, signifies the wonder of the world or the dose for immortality, and directions for gathering are upon the first two days of the 2d, 4th and 8th moons, when the stars are said to be propitious.

An investigation will prove the common belief that the aborigines were well versed in botanic medicine to be erroneous, as most of the plants used had no medicinal virtue and were used because of their supposed resemblance to some part or organ of the body, or again because the priest or physician had a dream to get this certain plant, and so it became fixed in the primitive materia medica. As before stated, none of these remedies were effective until some mysterious process had been performed and certain ceremonies were executed which had for their office the transference of power from the tutelary god to the plant. However, some remedies were used which were of great value, although all were subjected to the same ritualistic forms before using; yet a striking example of the union of both may be shown.

Since the days of Lister we have prided ourselves upon the excellence of our surgery as compared with that prior to the advent of antiseptics, yet centuries ago antisepsis was practiced upon the then undiscovered continent of America. A wound is inflicted upon the body of a warrior in battle or from accident upon the chase, and several days elapse before the wounded man is brought to his camp to be treated. The loss of blood, fever, accumulation of foreign matter at the seat of injury, have resulted in the formation of pus, and possibly sloughing has already taken place; the shaman and his assistants are summoned and the treatment begins. Beside a clear running brook a red willow grows, its roots bathed by the flowing stream. In a large cauldron the fresh roots of the willow are placed and covered with water from the stream and allowed to boil, and while it is boiling the shaman tells us that the spirit of the arrow has entered the wound which is decayed and dead. He believes that when an animal dies worms have entered and killed it, and because he sees them crawling in the putrifying mass he concludes that the worm has entered the wound of the patient and the flesh is dead.

The breath, which is white, is the spirit of the soul, and the blood, which is red, is the spirit of the body, and they both exist at the same time, as he well knows that when the white soul, the breath, ceases to come from the mouth, then the red soul, the blood, ceases to flow from the wound, and one cannot be without the other. So he takes the water, which is also white, and which also gives life, and the roots of the red willow which is watered by the stream, and is therefore a part of it and cannot exist without it (due to his observing that willows grow in wet and marshy places or along the banks of a stream), and the two make a red liquid by boiling, which resembles

blood and typifies the red soul. After prayers and sacrifices, etc., to the gods, the boiling liquid, now cool, is placed in the mouth of the shaman, and by blowing either directly from his mouth or by use of a reed he thoroughly cleanses the wound and blows into it the souls, white and red, and after dressing it to prevent the spirits from coming out before they have found their lodging place, the patient is allowed to rest. Thus he places or gives back the spirits which had departed, and he uses unknowingly an antiseptic solution, the active principle of which is salicylic acid.

The celestial bodies were supposed to have a great influence over disease, and the moon is in nearly all languages feminine, because of its coincidental relation to the functional activities of women, many of the diseases of women being ascribed to its baneful influence, and to avoid or relieve such maladies certain forms and rites are necessary.

Astrology accounts for many of the mysteries both of the cause and cure of disease. The collection of herbs at certain phases of the moon, and the planting of cereals or other crops must be upon the full of the moon, else, so they say, the fruit will turn to flower and the roots will shrivel and dry up. Moon-lore is too well known to enter upon at this point, although many examples bear directly upon the question at issue.

In the system of materia medica of the Chinese each organ had its specific remedy; thus, in a work written centuries ago, of which the following is a literal translation, this scheme was laid down:

"Of all roots that are produced, the upper half of what grows in the earth is known to possess the property of ascending the system, while the lower half has that of descending; as to the power of the branches, they medicinally extend to the limits of the body.

The peel or bark has influence over the flesh and skin; the pith and substance of the tree within the trunk operate upon the viscera; that which possesses light properties ascends and enters the region of the heart and lungs, that which is heavy descends and enters the region of the liver and kidneys; that which is hollow promotes perspiration, that which is solid internally attacks the internal parts of the system; that which is hot, but decayed, enters the breath, that which is mollifying enters the blood-vessels. Thus the upper and lower, the internal and external parts of a medicinal plant have each their corresponding effects on the human system."

For example, if you have a disease of the pleura or lungs you should take the bifurcated root of the mandrake, because it looks like a man, cut out the part which corresponds to the thorax and apply in a poultice to the chest.

For this reason fox's bones and otter's livers were given in consumption, and hart's and rhinoceros's horns, tiger's and elephant's bones were excellent in extreme weakness to strengthen and fatten the body, and a dose of tiger's bones was thought to impart courage.

In nearly every country the idea prevails that decayed teeth are due to the presence of a worm, which, as Cushing will show in an article to be shortly published, arises from their observance of worms in decaying animal and vegetable matter.

The Indian believes rheumatism to be due to a worm in the limb of the afflicted individual, or sometimes to the spirit of slain animals, usually the deer, thirsting for vengeance on the hunter.

This latter theory is clearly shown in stories told of poisoned arrows. It is well known that early man had no knowledge of toxicology as such, but seeing persons or animals die from the effects of certain agents, thought death to be due to a spirit going into the man. When a man died from the bite of a rattlesnake it was believed to be the spirit of the rattlesnake entering the body which produced this result. Accordingly, if one wished to destroy his enemies he induced the spirit of the serpent to act for him by the following process: A snake was killed and the arrows or other weapons were placed in the blood in a circle, and by prayers and incantations the spirit went into the missile and could be transmitted to the body of the victim.

The treatment of rheumatism illustrates the three methods. Among the Pueblo Indians a patient crippled, drawn up and twisted by this disease is given a decoction of the young shoots of the fern, because when young and tender they are curled up like the sick one, and as they grow they unfold and become straight, and therefore they cause the partaker to unfold and become straight. But this is not all: the fern is straight, but it cannot bend forward and backward except it be broken, and it alone would cause the sufferer to remain forever straight, unable to bend. To remedy this the measuring-worm is given mixed with the fern, as he not only has the power to straighten himself from his curled-up position, but he can resume it again at his pleasure.

The thaumaturgic or magical method is fertile in its resources, but only one is necessary, the wearing of magic charms, amulets, and cords or girdles. The use of iron crosses, rings and cords survives to-day, and a common practice among the negroes is to tie knots in a cord equal to the number of letters in the name.

The following formula and explanation for the treatment of rheumatism among the Cherokees is so interesting and illustrative of many points already noted that it will be given at some length. In the prayer reference is made to the "Great Ada'wehi," which is a term used to denote one supposed to have supernatural powers, and is applied alike to human beings and to the spirits invoked in the formulas.

FORMULA FOR TREATING THE CRIPPLER (RHEUMATISM)

Listen! Ha! in the sun land you repose, O Red Dog, O now you have swiftly drawn near to hearken. O great ada'wehi, you never fail in anything. O appear and draw near running, for your prey never escapes. You are now come to move the intruder. Ha! You have settled a very small part of it far off there at the end of the earth.

Listen! Ha! In the frozen land you repose, O Blue Dog. O now you have swiftly drawn near to hearken. O great Ada'wehi, you never fail in anything. O appear, etc. [Repetition.]

Listen! Ha! In the darkening land you repose, O Black Dog, etc.

Listen! On Wa hala you repose, O White Dog, etc.

Listen! On Wa hala, but now you repose, O White Terrapin. O great Ada'wehi, you never fail in anything. Ha! It has come to remove its hold on the bone. Relief is accomplished.

(Prescription.) Lay a terrapin shell upon (the spot) and keep it there while the five kinds (of spirits) listen. On finishing, then blow once. Repeat four times, beginning each time from the start. On finishing the fourth time then blow four times. Have two white beads lying in the shell together with a little of the medicine. Don't interfere with it, but have a good deal boiling in another vessel—a bowl will do very well—and rub it on warm while treating by applying the hands. And this is the medicine: What is called Yä′na-Utsĕ′sta ("bear's bed," the Aspidium acrostichoides or Christmas fern) ; and the other is called Kä′ga-Asgü′°tagĭ ("crow's shin," the Adianthum pedatum or Maidenhair fern) ; and the other is the common Egü′li (another fern) ; and the other is the little soft (leaved) Egü′li (Osmunda cinnamonea or cinnamon fern), which grows in the rocks and resembles Yanä-Utese sta and is a small and soft (leaved) Egü′li. Another has brown roots and another has black roots. The roots of all should be (used).

Begin doctoring early in the morning ; let the second (application) be while the sun is still near the horizon ; the third when it has risen to a considerable height (10 a. m.) ; the fourth when it is above at noon. This is sufficient. (The doctor) must not eat, and the patient also must be fasting.

Explanation.—The disease, figuratively called the intruder (ulsgéta), is regarded as a living being, and the verbs used in speaking of it show that it is considered to be long, like a snake or fish. It is brought by the deer chief and put into the body, generally the limbs, of the hunter, who at once begins to suffer intense pain. It can be driven out only by some more powerful animal spirit which is the natural enemy of the deer, usually the dog or the wolf. These animal gods live up above beyond the seventh heaven and are the great prototypes of which the earthly animals are only diminutive copies. They are commonly located at the four cardinal points, each of which has a peculiar formulistic name and a special color which applies to everything in the same connection. Thus the east, north, west and south are respectively the sun land, the frigid land, the darkening land, and Wä′halä′, while their respective mythological colors are red, blue, black, and white. Wä′halä is said to be a mountain far to the south. The white and red spirits are generally invoked for peace, health and other blessings, the red alone for the success of an undertaking, the blue spirits to defeat the schemes of an enemy or bring down troubles upon him, and the black to compass his death. The white and red spirits are regarded as the most powerful, and one of these two is generally called upon to accomplish the final result.

In this case the doctor first invokes the red dog in the sun land, calling him a great adäwehi to whom nothing is impossible and who never fails to accomplish his purpose. He is addressed as if out of sight in the distance, and is implored to appear running swiftly to the help of the sick man. Then the supplication changes to an assertion, and the doctor declares that the red dog has already arrived to take the disease and has borne away a small part of it to the uttermost ends of the earth. In the second, third and fourth paragraphs, the blue dog of the frigid land, the black dog of the darkening land, and the white dog of Wahala are successively invoked in the same terms, and each bears away a portion of the disease and disposes of it in the same way. Finally, in the fifth paragraph the white terrapin of Wahala is invoked. He bears off the

remainder of the disease, and the doctor declares that relief is accomplished.

The connection of the terrapin in this formula is not evident, beyond the fact that he is regarded as having great influence in disease ; and in this case the beads and a portion of the medicine are kept in a terrapin shell placed upon the diseased part while the prayer is being recited. The beads are white, symbolic of relief.

The blowing is also a part of the treatment, the doctor either holding the medicine in his mouth and blowing it upon the patient, or, as seems to be the case here, applying the medicine by rubbing, and blowing his breath upon the spot afterwards. In some the simple blowing of the breath constitutes the whole treatment.

The medicine consists of a warm decoction of the roots of four varieties of fern, rubbed on with the hand. The awkward description of the species shows how limited is the Indian's power of botanic classification.

The application is repeated four times during the same morning, beginning just at daybreak and ending at noon. Four is the sacred number running through every detail of these formulas, there being commonly four spirits invoked in four paragraphs, four blowings, with four final blows, four herbs in the decoction, four applications and frequently fourday tabu. In this case no tabu is specified beyond the fact that both doctor and patient must be fasting. The tabu generally extends to salt or lye, hot food, etc., while in rheumatism some doctors forbid the patient to eat the foot or leg of any animal, the reason given being that the limbs are generally the seat of the disease. For a similar reason the patient is also forbidden to eat or even touch a squirrel, a buffalo, a cat or any animal which humps itself. In the same way a scrofulous patient must not eat turkey, as that bird seems to have a scrofulous eruption on its head, while ball-players must abstain from eating frogs, because the bones of that animal are brittle and easily broken.

REIFICATION.

There comes a time in the civilization of every nation when medicine and religion are divorced. For one or another reason, usually peculiar to each individual community, there is a breaking away from the ecclesiastical power which holds all knowledge within its jealous embrace, and the people learn to investigate for themselves. The old superstitions and beliefs of supernatural powers in man give way before the evidence to the contrary in the physical world. This is the time when men go to the other extreme and say everything was created for a purpose, and they gather together a vast collection of half truths, due to erroneous and imperfect methods of investigation, and necessarily place a wrong construction upon them.

This accounts for the impetus given to the study of medicine in Europe in the middle ages ; but we find centuries later that a thousand years before the Christian era, in China, almost the same ideas existed, just as the independent discovery of printing and art of making gunpowder.

They believed that the body was composed of water, fire, wood, metal and earth, the five elements of which everything was composed. So long as the equilibrium was maintained

between them the person enjoyed health; as soon as one predominated, sickness ensued. To discover and then counteract that which predominated was the treatment. Inflammation was due to excess of fire. Distortion of eye and mouth was due to the excess of wood over metal which contracted the muscles. Under such circumstances, earth discharged its nature, its power relaxed in the interstices, the eyes became hollow and muscles contorted.

Their knowledge of anatomy was slight and superficial. Reverence for the dead forbidding dissection, until a much later period, their only knowledge was derived from animals, and curious enough, this same respect gave them a knowledge of osteology, as the bones were often arranged and preserved with scrupulous care by relatives and friends. The great viscera of chest and abdomen were known, but their relative positions were not. The heart was supposed to lie on the right side and the liver on the left. The circulation of the blood was known, but they were ignorant of the part played by the lungs in its purification.

"Throughout the human body a vivifying ethereal fluid was transfused, which was called *Ke* and resembled the ether of nature. According to the best ancient authors, water entered the body through the mouth. Beside the natural way of evacuation, it was either absorbed during cold weather by the Ke, or in hot weather it came out as perspiration; when grief oppressed the mind it appeared in shape of tears or was given out as saliva."

When the Ke was vitiated its ejection was obstructed, it accumulated and dropsy resulted, and a cure was effected by evacuation of water.

Their imperfect knowledge of the circulation gave rise to one of their most singular notions, the doctrine of the pulse.

The native physicians now say that owing to their delicacy of touch they can distinguish no less than 24 different kinds of pulse, and declare that for every part of the body there is a pulse peculiar to that particular locality. In the arm there are 3, the inch, the bar and the cubit; the liver has its pulse located in the right wrist, while the left governs the heart, and by examining the pulse in the various parts of the body they can tell disease and its cure; also whether a woman will give offspring and whether it will be male or female. Among the Turks and other Mohammedan people a similar doctrine is found.

The nose is the part of embryo which is first formed, hence in literature the nose ancestor was the designation of the original founder of a family.

Plato and Proclus had faith in the pentad or five (5) principles of nature, the 5 planets known to them presided over the five viscera, the 5 elements, 5 colors and 5 senses.

Mars was hot and dry; medicine bitter, red in color, affected the heart. Green medicine came from wood and operated on the liver. Red medicine came from fire and operated on the heart. Yellow medicine came from earth and operated on the stomach. White medicine came from metal and operated on the lungs. Black medicine came from water and operated on the kidneys.

The pentad and duad were the mysterious numbers of the Chinese as well as of many other nations. The *yang* and *yin*

or male and female energies in nature, the active and passive agents, form an important part in every department of Chinese learning, for they believe every phenomenon can be explained by these obscure and awful principles.

Yang, or male principle, is hot, cold, warm, or cooling: yin, or female energy, is sour, sweet, acid, or salt. The blood is of two kinds, yang or arterial and yin or venous; the first is strong, the latter is slight; the yang circulates throughout the body, while yin nourishes the soul and most of the bones and sinews.

Galen and Paracelsus, while retaining many of the beliefs noted in imputation, started on the long journey toward truth and reached the stage of reification, and their investigations and teachings left their impress for many generations.

They believed the brain to be a cold, inert gland whose function was to secrete a phlegm. The heart sent forth animal spirits, and the body was composed of four fluids, bile, blood, atrabile and phlegm.

Galen explained functional acts by forces or faculties; for example, food is conveyed to the stomach by an attractive faculty, is kept there by a retentive faculty, until it is converted into chyme by an alterative faculty, made to pass into the duodenum by an expulsive faculty, to be taken up by the veins and carried to the liver, where it was converted into blood by a blood-making faculty.

The four systems of Asellius became widespread in their influence, the chemical, iatro-mechanical, spiritual, and vital. There were five crises in the chemical: *ens australe*, or influence of the stars; *ens veneni*, or poisonous principles of food and drugs; *ens naturale*, or force which directs the microcosm; *ens spirituale*, or spiritual principle, whose action is seen in sympathy and antipathy; *ens Dei*, the spirit of God, which sends disease as a chastisement.

An analogous doctrine is found in the five principles of the Hindus, the elements of earth, air, fire, water and ether, from which the ancient philosophers of Greece derived their doctrine of the elements.

It must be borne in mind that the spirits referred to in this connection are not the same as were mentioned under the first two subdivisions, but are regarded as a physical or tangible force.

Although much of the imputed in medicines remained, yet it had a different signification. While the lights of a fox in wine (the fox being long-winded) or bear's gall in water were of great virtue in asthma, and wine in which the feet of a yellow hen have washed was a sure cure for jaundice, the remedies were regarded as having something of definite action, of a physiological or chemical nature, the exact character of which was not definitely understood.

Empiricism was in the heyday of its success; everything was used that could be used, and the extent and variety were simply appalling. Wolf's liver steeped in wine for cough, cow's blood in vinegar for spitting of blood, burnt deer's horn for fluxes. Pleurisy was cured by stockings a sheep's bladder while yet warm to the patient's neck.

Diseases of the ear were treated with worm-wood, ass's ears, earthworms steeped in vinegar and eel's blood boiled in wine. Moss from the skulls of animals and the powdered

thigh-bone of noted criminals were in high repute. The following prescription of Paracelsus, known as Paracelsus plaster, would be a boon to dermatologists in curing malignant growths, but unfortunately its method of preparation has become one of the lost arts:

R Take a quintessence of all of the gums in the world......¼ lb.
  Magistery of the magnet ....1 oz.
  Elements of the fire of amber (that is, the electrical fluid).1 lb.

And of such great strength was it that it was known to have pulled rocks of some size from their bed in the soil.

"There remains in the people a belief in the efficacy of drugs as drugs—a belief that for every bane there must be an antidote, so for every disease there must be a curative leaf or root."

From this step to the last an imperceptible change takes place; a gradual accumulation of indubitable facts brings us to that stage where all is demonstrated, all is logical, all is final, as far as it is possible to carry human inquiry, and the questioner is stilled, for all his queries are answered, or if not answered, he is satisfied that he is in the right path and by diligent pursuit will eventually reach the goal. This is the fourth or scientific stage.

SCIENTIFIC EXPLANATION.

What need be said further upon this point? Its history is our own history, its work is what we have and are doing, its aim, scope and outlines are well defined. We have but to correct the errors of the past and demonstrate things as they are.

PERITONITIS CAUSED BY THE INVASION OF THE MICROCOCCUS LANCEOLATUS FROM THE INTESTINE.*

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The conditions which underlie the causation of acute peritonitis have been the subject of so many studies during the past few years that many of those favoring or inhibiting its development are now well known. The experimental investigations of G. Wegner, Grawitz, Halsted, Barbacci, Tavel and others have conclusively shown that the healthy peritoneum possesses the power not only of rapidly absorbing or otherwise disposing of sterile fluids and solids, but also of disposing of a large number of saprophytic and pathogenic bacteria when these are introduced in such a manner as to avoid greatly injuring the tissues themselves. In order that pathogenic bacteria, introduced directly into the peritoneal cavity, may cause a peritonitis, general or circumscribed, evanescent or fatal, the normal conditions of the peritoneum must in some way be modified so as to afford an opportunity for the development of the bacteria. Measures which vitiate the vitality of the endothelial lining of the cavity, or which remove the organisms from the destructive action of the fluids and cells of the peritoneum, accomplish, as a rule, this result. Thus it is found that certain sterile soluble toxic substances, whether derived from the growth of bacteria or from the intestinal contents, permit, when introduced along with pathogenic bacteria, the growth of the latter; and this is doubtless, in part at least, due to the injurious effects which the toxic agent exerts upon the covering endothelial cells. Solid foreign bodies, which are themselves not capable of setting up inflammatory changes, afford, when introduced along with micro-organisms, a nidus suitable to their increase; and bits of strangulated tissue, as for example the omentum, do likewise; and both of these doubtless act by affording a place of settlement for the bacteria removed from the action of the living cells and fluids, permitting them to manufacture one of their chief weapons of offence, their toxines, and thus to provoke an acute peritonitis.

These two sets of conditions illustrate what commonly happens in the occurrence of peritonitis in human beings, in whom, it is to be assumed, the factors are not radically different from those in our experimental animals. And upon analysis it is found that most cases of peritonitis can be brought into one or the other of these categories.

The most frequent cause of peritonitis is perforation of the intestine, an accident which permits the ingress of the intestinal contents into the abdominal cavity, these contents carrying both the necessary foreign substances and the infecting micro-organisms. Lesions of the intestinal wall of a non-perforating character permit, as has been shown by Dr. Welch for the bacillus coli communis, not infrequently the escape of this organism into the peritoneum and elsewhere in the body. The alterations in the intestinal wall need not for this purpose be of a severe grade; congested areas and small hemorrhages in the mucosa often suffice. Not all, however, of these escaped organisms produce a peritonitis; indeed, in the majority of instances peritonitis does not develop. Netter has found that in most cases of fatal acute lobar pneumonia, coverslip preparations made from the glossy and uninjured serous coat of the abdominal cavity will show the presence there of the micrococcus lanceolatus, an observation which I have in several instances been able to confirm. It must be clear then that in human beings, as in experimental animals, some other condition than the mere presence of pathogenic micro-organisms in the abdominal cavity is necessary in order that peritonitis may be produced.

I conceive that if it is possible, in view of a lesion of the intestine, for micro-organisms to penetrate beyond the cavity of the intestines, to enter the mucosa itself and later to invade the deeper structures and finally appear in the peritoneal cavity, that the way is also opened for the escape of soluble sub-

stances into this cavity from the interior of the intestine, these substances being in part the products of the growth of the bacteria there present and in part of the chemical changes taking place in the ingesta. That these soluble products may in themselves, independently of bacteria, cause inflammation is shown by the existence of a fibrinous exudate upon the serous coat of the intestines enclosed in hernial sacs without bacteria (chemical peritonitis) ; and conversely, the presence of bacteria in the hernial fluid does not necessarily involve the development of peritonitis.

The existence of chronic inflammatory changes such as thickenings of the peritoneal coat and adhesions between neighboring viscera, are certainly not inconsistent with the assumption, in these parts, of an abnormal or lessened vital resistance.

Therefore it would seem as if these two conditions, namely, the opportunity for the escape from the interior of the intestine of soluble chemical substances into the abdominal cavity, and the pre-existence of chronic inflammatory changes, might become important factors in the development of peritonitis, the presence of the infecting micro-organism being assumed. And the recognition of their predisposing effect might serve to bring into better harmony the observed facts in human pathology with the results of experimental investigation. The following cases are offered as illustrating the effect of these two factors.

Another factor of great moment in the development of acute inflammations of serous surfaces is the alteration of the fluids and cells of the body which takes place in the course of chronic heart, liver and kidney disease. This topic, however, has no especial bearing upon this paper and will be dismissed here.

In the light of these considerations it becomes clearer why the colon bacillus, the micrococcus lanceolatus, and perhaps still other pathogenic bacterial species may be sometimes present in the peritoneal cavity without doing harm there, although the study of. the ætiology of peritonitis has shown that both of these organisms may be involved in its development. In passing, however, it may be stated that the bacillus coli communis is perhaps not so often concerned alone in the causation of peritonitis as has been supposed, but it is oftener associated with other micro-organisms, particularly streptococci and pneumococci.

The micrococcus lanceolatus has been found as the only organism present in acute peritonitis by Barbacci, Weichselbaum, A. Fraenkel, Sevestre, Courtois-Suffit, Netter, Gaillard, and Wright and Stokes. To their reports I now wish to add two cases.

The first case was a mulatto child, 3½ years of age, who was admitted into the medical service (Dr. Osler) of the hospital on Nov. 6th and died on Nov. 12th, 1892. At the time of admission the child had been ill for one week. At the first examination the abdomen was found to be distended and tympanitic, and there was evidence of some fluid. The urine was turbid, specific gravity 1010, it contained much albumen and hyaline and epithelial casts.

The autopsy was made six hours after death. Anatomical diagnosis: Chronic diphtheritic dysentery, acute exacerbation ; fibrino-purulent peritonitis ; broncho-pneumonia ; acute nephritis ; general anasarca. General infection of the body with the micrococcus lanceolatus.

Only that part of the protocol relating to the intestines and abdominal cavity is given. The solitary follicles of the jejunum were enlarged, and the patches of Peyer in this situation less so. In the ileum the Peyer's patches were more distinctly swollen, and areas in which the mucosa was hyperæmic were here present. In the region of the ileo-cæcal valve the intestine was much congested, and small deposits of fibrin were to be seen. The large intestine was thickened, and in the mucosa were many pigmented, slate-colored spots and small ulcerations. A small amount of a white, opaque exudate, very adherent, was applied in this region to the surface of the mucosa. This exudate did not make at any place a continuous layer, but was composed of separate dots hardly exceeding each the size of a pin's head. The peritoneal cavity contained a considerable amount (several thousand cubic centimeters) of a very thin, opaque and milky fluid in which small flocculi floated. The serous coat of the cavity and of the intestines was hyperæmic and covered with a layer of fibrin mixed with pus cells.

This exudate examined microscopically showed enormous numbers of a capsulated coccus, occurring chiefly in pairs, which was proven to be the micrococcus lanceolatus. The number of pus cells in the fluid was not very large, so that the turbidity of the fluid seemed in part due to the large number of micro-organisms present. The same organism was cultivated from the spleen, liver and kidneys. It was found in sections stained, with Weigert's fibrin stain, to be present in the lumen of the intestine.

The second case was a colored woman, 40 years of age, who was admitted to the gynæcological ward (Dr. Kelly) on March 10th last. At this time she complained of great abdominal pain and dyspnœa. She dated her present illness one week prior to admission ; the onset was with a chill, the abdominal pain appearing some days later. Upon admission the abdomen was only slightly distended in its lower zone, but it was excessively tender. On percussion there was tympany over the entire abdomen. The second day after admission the distension had increased and the tenderness was more pronounced. Temperature fluctuated between 101° and 102.5° F.; pulse quick. The vaginal examination showed the presence in Douglas' cul-de-sac of a mass the size of an enlarged fundus uteri. An exploratory incision was made by Dr. Clark on March 12th. The much distended intestines immediately extruded themselves through the opening. They were hyperæmic and covered with a thick layer of fibrin and pus. The peritoneal cavity was flooded with sterilized salt solution, the pelvis packed with gauze (a ruptured pyosalpinx was suspected) and the incision in part closed. Death occurred on March 14th at 1.30 P. M.

Autopsy, March 14th, at 4 P. M. Anatomical diagnosis: Diphtheritic entero-colitis. Acute fibrino-purulent peritonitis ; extension into the pleural cavities. Chronic pelvic peritonitis ; hydrosalpinx. Acute spleen tumor. Parenchymatous degeneration of viscera.

An abstract of the protocol is as follows : Body well nourished ; in the median line of the body, beginning 10 cm. below

the umbilicus, there is a linear incision, closed in its upper part with sutures, the lower part being packed with iodoform gauze. The edges of the incision are covered with a sticky, blood-stained, not distinctly purulent exudate which lightly agglutinates the edges. The parietal peritoneum is bound by light, recent fibrinous adhesions to the congested and distended intestinal loops over the lower zone of the abdomen. The omentum is spread out and covers the upper half of the cavity, and it is free from old adhesions. Both of its surfaces are covered with an opaque exudate. The intestines generally present small subserous ecchymoses, and they are covered by a fibrinous exudate, becoming much thicker at the edges of contact of the loops. The fibrin is thickest over the loops of the intestine which occupy the pelvis.

The uterus is bound by old adhesions to the bladder in front and the rectum behind. The left Fallopian tube is involved in dense adhesions; it is dilated and bent upon itself. The ovary is also enclosed in adhesions, and it occupies the recess formed by the bending of the elongated tube. In its entire length this tube measures 15 cm. It is smallest at the uterine extremity (size of little finger) and largest at the fimbriated end (size of thumb). The fimbriated extremity is hidden in the adhesions. The contents of this tube are clear and watery. On the right side there is a dense mass of adhesions in which is enclosed a cavity lined with smooth walls, the contents of which are slightly turbid fluid. At one extremity of this there is a pedunculated hydatid the size of a pea. The former represents the remains of the ovary. The right tube is less enlarged and it is buried in adhesions; it contains clear and thin contents. The cavity of the uterus is normal in size; the mucous membrane is velvety.

There is no pneumonia; the pleura is, however, covered at the base of the lungs, on each side, with a tolerably thick layer of fibrin. A similar layer also covers the diaphragm, but not completely. This exudate in the pleura was produced by the extension of the inflammatory focus through the diaphragm.

The jejunum is distended; in its upper portion it is less congested than the remainder of the intestine. The upper part of the ileum, which is distended throughout, shows only a slight congestion of the mucous membrane; but as the intestine is descended the congestion increases, although even here it is not uniformly present. Beginning 75 cm. above the ileo-cæcal valve, the mucous membrane of the intestine is diffusely congested, it is swollen and presents small hemorrhagic points. In this situation the surfaces of the valvulæ conniventes are covered with a heavy yellow fibrinous exudate, the intervening mucosa being covered with a lighter granular exudate. This area extends for a distance of 45 cm., leaving a stretch of intestine of 30 cm. above the valve free. The cæcum is greatly congested, it presents foci of necrosis and exudation which are stained with bile. In the ascending colon the follicles are enlarged for a distance of 20 cm., and the mucous membrane about them is swollen and ecchymotic. A fibrinous exudate is also present here.

The bacteriological examination of the exudate in the peritoneal cavity at the time of the exploratory incision showed one species only of micro-organisms, namely, a capsulated dip-

lococcus. The same organism was isolated from the abdominal cavity and from the exudate in the pleura at the autopsy. No other species could be found, and this one was proven to be the micrococcus lanceolatus. Cultures were also made upon agar-agar from the fibrinous exudation in the intestine. A diplococcus similar to the one found in the peritoneum was isolated.

Animal experiments.—A mouse was inoculated into the root of the tail, at the time of the autopsy, with a small quantity of the exudate from the pleura. It died on the 3d day. Locally there was an œdema which contained many typical capsulated diplococci. In addition there were an acute fibrinous pleuritis and pericarditis, in both of which the same species of organism was contained. A second mouse was inoculated subcutaneously with a small amount of the growth upon an agar-agar culture, derived from a single colony from the plates made from the exudate in the intestine. It died in $2\frac{1}{2}$ days. From the local process and the peritoneum of this animal many capsulated diplococci were obtained.

The study of the hardened tissues taken from both the large and small intestine showed the diphtheritic process to consist of a necrosis of the epithelial layer and the subjacent glands in the mucosa, upon which and in which a pseudo-membrane containing fibrin, leucocytes, detritus and bacteria was deposited. The leucocytic infiltrations extended into the depth, often filling the gland lumina, appearing between the glands, in and beneath the muscularis mucosæ, and in a variable amount being present in the the submucosa. The capillary blood-vessels in the mucosa were invariably hyaline and thrombosed in the areas of necrosis with pseudo-membrane formation, but sometimes in other places as well. Actual hemorrhages had taken place here and there into the mucous membrane. The submucosa showed a varying picture. In the congested and pseudo-membranous areas generally it was swollen. At times this swelling was an œdema in which only a few emigrated cells were visible; at other times much fibrin was present in it, with at the same time either few or many emigrated cells. The muscular coat was quite free from infiltration with fluid or cells. Sections stained with Weigert's fibrin stain brought out the bacteria in addition to the fibrin. As a matter of fact, although with the hematoxylin and eosine staining much fibrin was found to be present, yet by the former method some unsuspected areas came to view, and notably the material occluding many of the capillaries in the mucosa took on a vivid blue stain. In the false membrane many bacteria were found, and among these diplococci were easily distinguished. Corresponding with the situations of the false membrane, the bacteria could be traced into the glandular layer, both inside and between the glands, and they reached nearly but not quite to the muscularis mucosæ. However, in other situations in which no pseudo-membrane was present bacteria had passed into the substance of the glandular layer. In the deeper parts only two species could be distinguished, a diplococcus and a short bacillus, the latter often staining irregularly. The former predominated. Bacteria were not found to pass through the muscularis mucosæ, they were not found in the submucosa among the cellular infiltration, nor in the œdematous and fibrinous portions. Diplococci were only

very exceptionally found in spaces (lymphatics?) in the subserous coat, less often in the intermuscular fibrous fasciculi. There was no evidence therefore of a continuous growth through the intestinal coats. There was evidence, however, of a transportation by the lymph current. Upon the peritoneal surface great numbers of the characteristic diplococci were found.

The especial interest in these cases concerns first the nature of the micro-organisms causing the acute peritonitis; second, the demonstration of their invasion from the intestine in the absence of perforation, and third, the part believed to have been played in the one by a chronic dysenteric process, and in the other a chronic peritonitis, in rendering the peritoneum susceptible to the action of the introduced micrococcus lanceolatus.

A RAPID METHOD OF MAKING PERMANENT SPECIMENS FROM FROZEN SECTIONS BY THE USE OF FORMALIN.

By Thos. S. Cullen, M. B.

Any one who has hardened tissues in formalin will be impressed with the rapidity of its action, with the firm consistence of the tissue, and with the absence of the contraction of the specimen so often seen when alcohol is used as the hardening medium. Microscopical examination of a specimen hardened in formalin, as we all know, shows almost perfect preservation of the cellular structure. Recently it occurred to me that formalin might be used in the preparation of frozen sections.

One of the greatest difficulties experienced in rendering frozen sections permanent lies in the fact that when passed through alcohol the section frequently not only contracts but contracts irregularly, distorting the specimen; further, such specimens will often stain imperfectly. The use of formalin will obviate these difficulties, allowing one to make an excellent permanent specimen from the frozen section. My method is as follows: The tissue to be examined is frozen with carbonic acid or ether and then cut; the sections are then placed in 5 per cent. watery solution of formalin for 3 to to 5 minutes, or longer if desired; in 50 per cent. alcohol 3 minutes, and in absolute alcohol 1 minute. The tissue is now thoroughly hardened and can be treated as an ordinary celloidin section, being stained and mounted in the usual way. On examining this mounted section one might readily take it for a well preserved alcoholic specimen. Supposing we stain with hæmatoxylin and eosin, the entire process is as follows:

a. Place the frozen section in 5 per cent. aq. sol. formalin for 3 to 5 minutes.

b. Leave in 50 per cent. alcohol 3 minutes.

c. In absolute alcohol 1 minute.

d. Wash out in water.

e. Stain in hæmatoxylin for 2 minutes.

f. Decolorize in acid alcohol.

g. Rinse in water.

h. Stain with eosin.

i. Transfer to 95 per cent. alcohol.

j. Pass through absolute alcohol, then through either creasote or oil of cloves, and mount in Canada balsam.

The blood is lost in frozen sections. To overcome this Prof. Welch suggested that the specimen be first fixed in formalin and then frozen. I tried this and found that we were able to preserve the blood, but that it did not stain very distinctly. For convenience this second procedure will be called method II. The essential factor is the same in each case. The latter process, however, requires at least two hours. A small piece of the tissue is thrown into 10 per cent. solution formalin for two or three hours. It is then put on the freezing microtome and thin sections can be readily made. The sections are stained in the usual way. The detailed procedure of method II is as follows:

a. A piece of tissue 1x.5x.2 cm. is placed in 10 per cent. aq. sol. formalin for 2 hours.

b. Frozen sections are made.

c. Left in 50 per cent alcohol 3 minutes.

d. In absolute alcohol 1 minute.

e. The sections are now run through water and stained in hæmatoxylin for 2 minutes.

f. Decolorized in acid alcohol.

g. Rinsed in water.

h. Stained in eosin.

i. Transferred to 95 per cent. alcohol.

j. Passed through absolute alcohol, then either through creasote or oil of cloves, and mounted in Canada plug balsam.

For ordinary use method I is all that is required. Given a piece of tumor from the operating room, it is possible to give as definite a report in 15 minutes as one would be able to give after examining the alcoholic or Müller's fluid specimens at the expiration of two weeks. Method II is of especial value in the examination of uterine scrapings. Instead of putting them in the 95 per cent. alcohol in the operating room, they may be immediately dropped into 10 per cent. aq. sol. formalin. By the time the pathologist receives them, which is at least two hours afterwards, they are firm enough to be frozen without difficulty, and permanent sections can be immediately made. The second method is to be recommended for all delicate tissues. In employing these methods one must remember, as for example in epithelioma, that some of the cell-nests will drop out, there not being anything to hold them *in situ*, as there is when celloidin is used. We have, however, hardened and stained epithelioma of the cervix by this method without the slightest difficulty.

THE CONDITION OF THE GEMMULES OR LATERAL BUDS OF THE CORTICAL NEURODENDRON IN SOME FORMS OF INSANITY.

A PRELIMINARY NOTE.

By Henry J. Berkley, M. D.

In the early years of the chromate of silver methods, the protoplasmic extensions of the nerve cells were considered to be of comparatively little importance in comparison with the cell body and axis-cylinder process. Golgi thought their function to be principally nutritive, and that they had junctures with the vascular glia and blood-vessels, while Nansen went to the limit of denying to them the property of nervous function, relegating it entirely to the axis-cylinder.

The discovery that the axis-cylinder was occasionally an offshoot of one of the protoplasmic processes at some distance from the cellular body was a powerful factor in producing an alteration in these views, and to-day the cell branches are regarded as an essential portion of the nervous apparatus, having an almost equal significance in the production of the nervous impulses with the cell body; hence the now universal adoption of the name neurodendron, or neurodendrite, for the branches.

With the neurodendron, the lateral buds, or gemmulæ, have gradually acquired more and more significance. Kölliker in 1891 looked upon them as artifacts, while in various recent reviews of the nerve cell they are disregarded entirely, or their presence is simply mentioned, for they are considered to be of no import in the economy of the nerve cell. More recently, however, Lenhossék testifies to their constant presence in silver preparations, and has actually demonstrated them in fine Nissl preparations. Cajal and Retzius also admit their universal presence on the dendrites of the pyramidal cells of the cerebrum and the Purkinje cells of the cerebellum. None of the writers who mention them at all advance a theory as to their nature, beyond that they are possibly chromophile particles attached to the sides of the dendrons, nor do they attach much significance or importance to them.

Another point in regard to the gemmules is that they are supposed to be much more prominent in early than in adult life; an idea which, in view of recent developments in the histology of the nerve cell, seems to be disproved. The probable truth of the matter lies in the circumstance that the earlier chrome-silver methods only stained the buds very imperfectly, or in a manner not sufficiently striking to direct much attention to them, the rounded knob at the free extremity commonly being more definitely stained than the stem.

However, recent methods of obtaining silver impregnations have brought them out more and more clearly, until now they form an important portion of the picture of nearly all of the cortical cells.

I have recently observed, by means of a new and seemingly constant method of silver staining in a number of slides from cases of chronic alcoholism, and from demented subjects, a distinct alteration in these gemmulæ that foreshadows the discovery of a class of pathological lesions of the brain cells which we have hitherto not been able to see by any mode of nerve-cell staining in possession of the pathologist. The cases from which we have drawn are still few in number, nine in all, from the cerebra of seven alcoholics and two dements; but the changes have been always present; and more important, in the brains of several rabbits which had been subjected to the ingestion of considerable quantities of alcohol, the differences between the dendrons of the control and those from the alcoholic brains were most striking, for not only were lesions present, but they were invariably constant. It is true that these changes form only a portion of the lesions of the nerve cell, but being the most prominent they at once attract attention.

Briefly, in both alcoholics and dements they consist in a diminution of the lateral buds, proceeding in well advanced cases to a total disappearance of the short side processes. Not only does this change affect the larger pyramidal cells, but also the smaller angular and irregular ones, and eventually ends in a lessening in size of the protoplasm of the dendron, besides the stripping of the buds from its sides.

It would seem that by the use of this new method of staining—the phospho-molybdate of silver in free nitrate of silver —which offers a constancy and fineness of detail before unattainable in pathological preparations, that we have almost passed the borderland of the uncertainty of mental disease, and will be able to relegate, in the fullness of time, all decided mental changes to the same definite category in which we are now able to place the formerly obscure diseases of the nervous system, whose lesions are now more or less thoroughly understood, and place psychiatry upon the same footing as many of its sister branches of medicine that rest upon a secure pathological basis.

REPORT IN GYNECOLOGY, III.

By T. S. Cullen, M. B.

I. Hydrosalpinx, its Surgical and Pathological Aspects, with a report of twenty-seven cases.
II. Post-operative Septic Peritonitis. Numerous plates.

REPORT IN DERMATOLOGY, I (in press).

Containing Protozoic Dermatitis, Molluscum Fibrosum, Urticaria, etc. By T. C. Gilchrist, M. R. C. S. Many Illustrations.

PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS HOSPITAL MEDICAL SOCIETY.

Meeting of January 21, 1895.

Dr. Abel in the chair.

Exhibition of Specimens: Cases of Tuberculosis.—Dr. Flexner.

1. Primary tuberculosis of the serous membranes involving the pleura and peritoneum. Tuberculosis of the mediastinal, pericardial, tracheal, bronchial, peritoneal and retroperitoneal lymphatic glands. Perforation of an adherent bronchial gland into the bronchus. Extension of tuberculosis from the peri-pancreatic tissue into the pancreas. Tuberculosis of the intercostal muscles. Healing infarction of lung.

The patient was a colored man, 35 years old, who dated his last illness from October 3, 1894. He was admitted into the medical wards of the hospital, October 13, 1894; he died December 6th at 2 A. M. At the meeting at which the specimens from this case were exhibited, Dr. Osler made the following remarks upon them: "On admission the patient had high fever, but nothing was to be discovered locally except the involvement of the pleura. A slight effusion into the left pleural cavity occurred, and the aspirated fluid, which was clear, gave negative results in cultures. Subsequently the case changed very much in character. Instead of a continuous fever it became extremely irregular and intermittent, and for nearly ten days there was intermittent pyrexia. For 8 to 10 hours out of the 24 the temperature not only fell to normal, but subnormal, indeed down to 97° or even 96°. Two or three weeks after his entrance into the hospital he began for the first time to have abdominal trouble. No especial tenderness was present, but the abdomen became large, and distinct areas of induration made their appearance. One of these lay transversely across the upper portion of the abdomen, and this we thought was the thickened omentum. Taking the pleurisy and involvement of the peritoneum into consideration, we thought the diagnosis of tuberculosis tolerably certain in spite of the absence of any local indications of tuberculosis. The patient had no cough, and no expectoration came from the lungs. He had a small amount of mucoid expectoration, which was carefully examined and found negative. The day before his death, as I was dictating a note upon his case, my attention was attracted to a nummular mass of sputum in the basin at his bedside. It was so unlike anything that had been previously seen that I asked the nurse if it had come from this patient. She said it had. It was at once examined and found full of tubercle bacilli. The patient had no involvement of the lungs, and, as the autopsy showed, the bacilli came from a softened lymphatic gland which had perforated into one of the bronchi."

The main features of this case are as follows: *The left lung and pleural cavity.*—The left lung is bound in places by firm adhesions to the costal wall. The two layers of the pleura are much thickened and contain large and small tubercles. The two layers are not everywhere in contact, and where they are separated, stringy masses of fibrin run from one surface to the other. A small amount of fluid occupies these spaces. The pleura covering the diaphragm is also much thickened, and to this the lung is firmly attached. On section, the lung is dark in color, it is not entirely airless, and it is entirely free from tuberculous infiltration. The vessels and bronchi are free. The *larynx and trachea* are free from ulceration. There are adhesions between the right bronchus just below the bifurcation and a packet of enlarged and tuberculous lymph glands. In this bronchus, 2 cm. below the bifurcation, affecting the division going to the lower lobe, there is a perforation due to the softening of one of the adherent glands. The surface of the bronchial mucous membrane corresponding to this is covered with necrotic material easily removed, and the blood-vessels of the adjacent mucous membrane are congested.

The *right lung and pleura* are free from tuberculous infiltration; but in the lower lobe of this lung there is a consolidated area as large as a hazel-nut, of a brownish-red color centrally, and a paler peripheral portion, which proved to be an infarction partly decolorized and undergoing organization.

Intercostal muscles.—Beneath the fascia covering the intercostal muscles are small tubercles and several larger caseous areas. The largest equalled a pea in size. The masses are imbedded in the muscle substance, as shown by the microscopical examination.

Peritoneal cavity.—The abdominal wall is bound by firm adhesions to the omentum, and the omentum in turn to the visceral layer of the peritoneum. The omentum extends over the entire front part of the cavity of the abdomen, descending to the superior surface of the bladder and extending well into the lateral regions of the cavity. The omentum is much thickened, the thickening being greatest over the site of the transverse colon. This thickening is due to the development of discrete tubercles and diffuse tuberculous tissue within its substance. The peritoneal covering of the intestines contains many discrete tuberculous masses, yellow in color and opaque, resembling those in the omentum. The intestines are matted together by these as well as by a stringy, yellow fibrinous exudate. The parietal peritoneum is covered with similar tubercles, and the vesico-rectal fossa also. All the viscera are surrounded by a tissue containing tubercles and tuberculous tissue, and thus firmly bound to adjacent structures. The under surface of the diaphragm is studded with tubercles and firmly united to the liver.

The *pancreas* is involved in a firm mass of adhesions, and in the region of the duodenum its substance for a distance of 3x3 cm. is invaded by a tuberculous growth. This mass is of an opaque, yellowish color. Upon microscopical examination it is composed of caseous material, and in the edge next the pancreas discrete tubercles are visible in the granulation tissue there present. The gland acini are very indistinctly visible in the caseous area, and they are fast disappearing from the advancing edge of tuberculosis.

2. Phthisis pulmonalis with the formation of large trabeculated cavities. Tuberculous bronchiectatic cavities. Tuberculosis of epididymes, testicles, seminal vesicles, prostate gland, bladder and kidney. Adhesion between the left semi-

nal vesicle, prostate and urethra, perforation of the urethra. Tuberculosis of liver, spleen and adrenal glands.

The patient, a colored man, was admitted into the medical wards of the hospital (Prof. Osler), December 14, 1894. The present illness was dated from July, 1894. The physical examination indicated a large cavity in the left apex, and also a cavity on the right side. Behind the right testicle an enlargement, apparently connected with the epididymis, was felt. The sputum contained many tubercle bacilli.

Lungs.—The upper lobes of both lungs contain large trabeculated and communicating ulcerative tuberculous cavities. In the left lung there are several bronchiectatic cavities as well.

Adrenal glands.—The left is much enlarged; its dimensions are 8x3.5x1 cm. It is surrounded by adhesions. On section it is found to be converted into a firm caseous mass. The right adrenal measures 4x3x1 cm., it is also involved in adhesions, and on section shows a similar tuberculous transformation.

Scrotum, epididymes, testicles, seminal vesicles, prostate gland, urethra, bladder and kidneys.—On the left side of the scrotum there is a small fluctuating mass the size of a walnut which is not distinctly connected with the testicle. The skin over this swelling is congested and glazed. On section this proves to be an abscess cavity containing caseous pus. The epididymes are much enlarged and tuberculous, and on the left side there are adhesions between the epididymis and the scrotal tissues corresponding to this abscess. In the testes are scattered grey and firm tubercles. The seminal vesicles are enlarged and tuberculous. On section of the left one it is found to be converted into a thickened and indurated mass containing a central cavity filled with softened caseous material. The walls of this cavity are almost of cartilaginous hardness. Between the enlarged vesicle and the prostate gland an adhesion had taken place, and the softening of this part of the wall of the vesicle has extended into the prostate and through it to the urethra. Thus a perforation of the urethra 2 mm. in diameter, which is situated in the prostatic portion to the left of the verumontanum, had taken place. This perforation communicated with the cavity of the vesicle. The right seminal vesicle is converted into a caseous mass which has just begun to soften. The mucous membrane of the bladder is, in general, pale. Just above the neck of the bladder the mucous membrane is œdematous, and this œdematous condition extends to the lower angle of the trigonum. In the mucous membrane corresponding with this œdema are small, elevated, opaque nodules of the size and general appearance of miliary tubercles. Descending, these nodules become more numerous and a little larger in the mucous membrane of the prostatic portion of the urethra, and here there is considerable congestion of the mucous membrane. The kidneys are swollen, the capsule is removed with difficulty, and minute hemorrhages are evident in the substance of the organs. Each kidney presents a tuberculous nodule as large as a walnut, which is located for the most part in the pyramidal portion, but extends into the cortical part as well.

Notwithstanding the tuberculosis of both adrenal glands, there were no symptoms or other indication of Addison's disease in this case.

An Ideal Result following Double Tenotomy in a Case of Convergent Strabismus.—Dr. Theobald.

This case is of interest for several reasons. In the first place the squint was of very high degree; in the second place it had existed some 33 or 34 years; and thirdly, the result obtained was exceptional.

Before describing the case it will be well to say a few words as to the difficulties which beset us in obtaining good results in squint operations. No operation for squint is perfectly successful unless it restores binocular vision. The restoration of binocular vision would be a very easy matter in almost all cases but for one thing—after an eye has squinted for some time it almost invariably becomes more or less amblyopic. As the squint develops it is, at first, intermittent; the eye squints in, from time to time, during accommodation perhaps, and at other times is straight. With each turning in of the eye there occurs double vision. This double vision produces so much annoyance that the brain at once begins to shut out the vision of the squinting eye, and as a result of this a marked amblyopia soon develops in this eye. It is this amblyopia which often makes it a difficult matter to bring about binocular fixation after tenotomy. We very often find, after an eye has been squinting for some time, that its fixation is eccentric; in other words, if we close the non-squinting eye and direct the patient's attention to some object, he will not look directly at the object, for the vision of the macula region is not so good as that of some eccentric portion of the retina, and hence he prefers to direct this eccentric portion of the retina towards the object he is regarding. I have seen cases where, after a tenotomy, the muscular balance was almost perfect, and yet the eye which previously had squinted seemed to have no disposition whatever to follow the movements and to fix with the other eye, the whole tendency to binocular vision seemingly having been destroyed, the eye squinting sometimes in a little and and again out a little whilst the other eye was fixing a given object.

This question of the amblyopia of squinting eyes is one that has attracted a great deal of attention in recent years. Donders and Von Graefe, and the authorities of their time, accepted the view to which I have just referred—that the amblyopia is produced by the squint; that when the eye begins to squint there is so much confusion from the double vision that the brain shuts out the vision from this eye, and that in time amblyopia is produced as the result of this. This was the view generally accepted until a comparatively short time ago, when Schweigger and Alfred Graefe advanced a different view. They held that instead of the squint being the cause of the amblyopia, the amblyopia was the chief cause of the squint; that the amblyopia was congenital, and that the amblyopic eye having little capacity to fix with the other eye, was prone to become strabismic. This view is the one which at the present time probably receives the most general acceptation. It has not commended itself to my judgment, however, and in 1886 I wrote a paper, published in the transactions of the American Ophthalmological Society, bearing upon this question—whether the amblyopia was dependent upon the squint or whether the squint was dependent upon the amblyopia. A significant point which I laid stress upon at that

time is this: the exact location of the amblyopic area in the retina of the squinting eye. When an eye first begins to squint there are two images in it which are especially troublesome. One is the image of the object which the individual is regarding with the non-squinting eye, and which of course is formed upon an eccentric portion of the retina of the squinting eye; the other is the image which happens to fall upon the macula region of the squinting eye. The former is the image which causes the individual to "see double"; the latter is especially annoying because it overlies and is mentally confused with the image of the object which is being regarded by the properly-directed eye. These are the two images which must be suppressed if the individual is to enjoy even tolerable visual comfort. For this reason there are two portions of the retina of the squinting eye, supposing the amblyopia to be the result of the squint, where we should expect the amblyopia to be most marked. These two portions are the macular region of the squinting eye, because there the individual must get rid of the object which is seen confused with the object he is looking at; and the other is that portion of the retina in the squinting eye which receives the image of the object which in the properly directed eye is formed upon the macula. In convergent squint the part of the retina in question lies to the nasal side of the macula, while in divergent squint it lies to the temporal side. Now this is exactly what we find to be the case in squinting amblyopic eyes. The macular region is found to be highly amblyopic, and in convergent squint the inner portion, and in divergent squint the outer portion of the retina. This to my mind is almost conclusive evidence in favor of the view that the amblyopia is really produced by the squint.

Since my paper was read in 1886, several very interesting cases have come forward bearing upon the question at issue. One is a case reported by Dr. Roosa. Schweigger makes the point that no case has ever been reported where a person has been known to have had normal vision in an eye which has afterward squinted and become amblyopic. It would seem that there should be dozens of such cases. Such is not the fact, however. The reason is that concomitant squint almost always develops in early childhood, usually before the age of five years, and, as may be supposed, the occasion and the opportunity to test the vision before this age rarely presents itself; furthermore, it is almost impossible to test the visual acuteness with any degree of satisfaction at so early an age. Dr. Roosa has reported, however, in his recently published work upon eye diseases (p. 549) a case of this character. A girl seven years of age was brought to his office and was found to have practically normal vision in both eyes. Ultimately she developed a squint, and later on was brought back again, and the squinting eye was then found to be decidedly amblyopic.

A still more interesting case was reported by Dr. W. B. Johnson, of Paterson, N. J., to the American Ophthalmological Society. Here the reverse happened—an individual who had been extremely amblyopic in a squinting eye regained normal vision in it. The significance of this case is, that if the amblyopia had been congenital the vision would certainly not have been regained in the way it was. The facts in this case were these: A man, 19 years of age, had squinted in his left eye since three years of age. The other eye was good. In the squinting eye he could only count fingers at six inches. He visited Dr. Johnson just before the accident about to be related occurred, and his vision was tested with the result stated. A few days afterward he received an injury in the normally directed eye, from a piece of steel or iron, and the eye had to be enucleated. This left him only with the previously squinting and highly amblyopic eye. The case was carefully watched and studied by Dr. Johnson. The day after the enucleation of the injured eye the patient expressed himself as seeing better already with the squinting eye. Seven days after the accident the vision had increased from counting fingers at six inches to $\frac{20}{50}$. Thirteen days afterward, with a $+1.75$ glass, he was able to read Jaeger No. 9. Eighteen days after the accident he had full normal vision, and this condition lasted when he was last examined three years afterwards. This case was regarded by members of the Ophthalmological Society as having an important bearing upon the question of the origin of amblyopia in squinting eyes. The amblyopia in this instance was certainly acquired, because, if congenital, vision would not have been restored as it was. These two cases have especially interested me because they so strongly sustain the view which I argued in favor of a few years since.

The case I wish to speak of was that of a man 37 years of age. His right eye squinted strongly inward. His strabismus was due to a fall and had existed 33 or 34 years. The origin of the squint is significant. Where a squint develops as the result of a fall it is almost necessarily a paralytic one and manifests itself quickly. It does not go through the usual stages of a slowly developing concomitant squint, as previously described. In paralytic squint good vision is more likely to be retained in the squinting eye than in concomitant squint, for as the squint is usually of high grade and forms quickly, it is not so essential that the amblyopia should be developed in order to rid the individual of the annoyance of double vision. This patient had normal vision in his left eye and $\frac{20}{30}$ vision in the squinting eye. He consulted me in September, 1894, but did not consent to have his eye operated upon till March of the present year. I did a very free tenotomy of the right internal rectus. I not only cut the tendon proper, but also divided very freely Tenon's capsule. After this operation there was still a considerable residual squint left. Three days afterward I did a free tenotomy of the internal rectus muscle of the opposite eye. After free division of the tendon and free section of Tenon's capsule there was still a slight residual squint, so I introduced a conjunctival stitch and attached it to a plaster strip on the temple. The first operation was done March 8th, the second March 11th. On March 12th, after the removal of the stitch, I found he had binocular vision, and here came the especially interesting feature of the case. Usually in making our tests of the lateral balance of the muscles we find that in distant vision, a four or five degree prism, base up or down, will produce a degree of vertical diplopia which the eyes cannot overcome. This man's eyes were so intent upon maintaining binocular vision that it was necessary, even the very day after the second tenotomy, to use a vertical prism of seven to eight degrees in order to keep the images apart. With a prism of four or five degrees the eyes

would blend the two images at once. The lateral muscles were tested in this way, and there was found to be an insufficiency of the external recti muscles varying from 1° to nothing. On March 15th I found it necessary in the vertical diplopia test for distance, to use a nine degree prism to prevent the eyes from merging the two images, and in the near test it was necessary to use one of eleven degrees. There was lateral orthophoria, both in the distance and in the near, and no hyperphoria. When the eyes of this individual were once put in such a position that binocular vision was possible, they seemed to be much more intent upon maintaining it than normal eyes usually are, although they had been squinting for 33 or 34 years and during all this time had never known what it was to work harmoniously. This very unusual feature of the case is what seemed to make it worth reporting.

NOTES ON NEW BOOKS.

Therapeutic Suggestion in Psycopathia Sexualis. By Dr. A. von SCHRENCK-NOTZING. Translated from the German by Charles G. Chaddock, M. D. (*The F. A. Davis Co., Philadelphia.*)

The last decennary has been productive of a kind of noxious medical literature that may be likened to the works of Zola and other writers of a similar school in the world of fiction. Most unfortunately, it was one of the best known of the German alienists who, nine years ago, started the craze for the word-painting of abnormal sexual instincts, and since that date his work has passed through seven editions in the mother-tongue, besides a number of translations. The extensive demand for this class of literature cannot come from the medical profession, few of whom are interested in sexual anomalies; and for such morally detrimental books to fall extensively into the hands of the laity is but to add fuel to already existing flames; for nothing could be more productive of Scythian morals than to place such works in the hands of the general public, and then—auto-suggestion is all-sufficient to produce a heavy increase in the clientèle of perverted sexuals.

We have before us, by the English translator of Krafft-Ebing's "Psycopathia Sexualis," another work of similar scope, by a Munich practitioner of medicine, and one of very doubtful utility, for which the only excuse that can be advanced by its author for its creation is that it is a plea for the treatment of sexual derelicts by suggestion. The book is in very large part built up of the remnants of other pseudo-scientific studies by Krafft-Ebing, Hammond and Moll, which may readily have been read in the original and surely do not need to be repeated in all their nauseating nudity.

By far the best written pages in the book are to be found in the chapter on the "history of the development of contrary sexual feelings among the ancients," and the whole chapter constitutes a historical sketch of some value.

There are a number of curious and erroneous expressions in the work, but as we do not happen to have the original at hand, it is impossible to determine whether they belong to the author or translator. Sentences like the following occur, "Automatic masturbation occurs at a certain age in idiotic dements." Sollier would indeed find it difficult to define an "idiotic dement." Another sentence is equally striking: "A variety of weak-mindedness which is caused by an abnormal tendency to immoral acts; a sign of a low grade of

idiocy which is known under the name of 'imbecility.'" The author's idea of the idiot and the imbecile can only be said to be widely at variance with that in common acceptance—if nothing more.

The best that one can say for the book, and all those of a similar character, is that they are morally unhealthy, have a tendency to create the very vices they purport to cure, and from every standpoint it were well if they had never been written.   H. J. B.

Corrado Parona: L'Elmintologia Italiana da' suoi primi tempi all' anno 1890. (Atti della R. Università di Genova, Vol. XIII, 1894, 729 pgs., 1 map.)

The end of this century is marked in medical zoölogy by a movement on the part of the specialists to collect the entire literature up to date, so that we may start off in 2001 with a full knowledge of exactly what has been accomplished in this field. This movement has been found a necessity, not only from a general standpoint of thoroughness, but because helminthologists are now accepting the "Law of Priority" in order to do away with the great evil of having half a dozen different names for each parasite, and half a dozen different parasites for each specific name. In writing bibliographies in various parts of the field of medical zoölogy a number of men have already rendered great service, but all efforts heretofore made have now been overshadowed by the Italian scientist, Corrado Parona. The work done by this author and published in his *L'Elmintologia Italiana* is so extensive and valuable that one almost hesitates to review it for fear of not giving Parona the full credit due him.

The book is divided into four principal parts: the first part gives a general historical review of parasitology in Italy, beginning with the writings of Plinius and Celsus; the second part covers the classification of the parasites, cross-references being given under every family, genus, species, etc., to all the Italian works in which the forms are mentioned; in part third we find the geographical distribution of the parasites for all the provinces of Italy, the authority being cited in every case; part four is the portion which is of especial value, as it contains full bibliographical references to all Italian articles on parasites, together with short, concise abstracts of each article accessible to the author. In this bibliography we find numerous observations on parasites which have totally escaped the attention of other workers, in all 1146 separate titles being cited.

Particular stress, throughout the entire work, is laid upon the parasites of man, and at the end of the volume a map of Italy is given showing the geographical distribution of the most important helminths infesting the human species.

Should Corrado Parona, to whom we already owe numerous observations in helminthology, never write another word upon the subject, he will, through his *Elmintologia Italiana*, always be known as the man who has done more to bring Italian parasitology to the attention of the world than any other single worker.

WARDELL STILES.

THE MALARIAL FEVERS OF BALTIMORE.

An Analysis of 616 cases of Malarial Fever, with Special Reference to the Relations existing between different Types of Haematozoa and different Types of Fever.

BY WILLIAM SIDNEY THAYER, M. D., AND JOHN HEWETSON, M. D., Assistants in the Medical Clinic of The Johns Hopkins Hospital.

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Forming part of *The Johns Hopkins Hospital Reports*, Vol. V, 1895.

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BULLETIN

OF

THE JOHNS HOPKINS HOSPITAL.

CONTENTS.

MEDICAL LORE IN THE OLDER ENGLISH DRAMATISTS AND POETS (EXCLUSIVE OF SHAKESPEARE).

By ROBERT FLETCHER, M. D.

[Read before the Historical Club of the Johns Hopkins Hospital, May 13, 1895.]

Upon hearing the title of this paper it may, perhaps, excite your surprise that Shakespeare should be specifically excluded from the list of authors, since his plays abound in allusions to medical matters. But everything relating to the special lines of knowledge of that unequaled writer has been so thoroughly investigated, every allusion to medicine, law, religion, folk-lore, flowers, birds or animals, has been so worked into essay or book, that there is nothing which could now be said that would not seem trite or stale. There is half a column of references to the literature treating of medicine in Shakespeare in the Index Catalogue of the National Medical Library, and still there comes from time to time some journal from the Far West—an Oklahoma Medical Clarion, perchance—with the familiar title in its table of contents of "Shakespeare's medical knowledge," or "Remarks on Hamlet's madness from a psychological standpoint."

In the course of a somewhat miscellaneous reading, aside from professional studies, it has been my custom through many years to copy passages relating to medical subjects, and it is from the rather opulent collection which has been thus formed that I have selected some readings for to-night, which I trust may be found novel and entertaining and possessed of some interest from a historical point of view. It is difficult to put such disjointed material into any workmanlike shape, and you will kindly make allowance for the species of mosaic work submitted to you. It would be an easy matter to take an author's works, or a single play, and read out all the medical allusions to be found therein, but I have thought it better to select certain subjects to be illustrated by quotations. The first subject will be the condition of medicine generally in what is termed the Elizabethan period, and the estimation in which its practitioners were held by the people : next, early references to the venereal disease and its treatment, and lastly, some miscellaneous curiosities of therapeutics and the like. I shall not trouble you with extracts relating to materia medica merely ; they are very numerous, and one division of the subject, which I may term the Witches' Pharmacopœia, and which is extremely curious, would alone occupy the canonical hour of your evening.

It is perhaps not an unfair test of the popular repute in which a profession is held to observe how its members figure in the novels and plays of the period. Certainly in the works of the great novelists of our own time the doctor appears in a most admirable light. He may be eccentric, but is always benevolent, and sometimes skillful beyond the power of attainment of any living physician. Judged by this standard, the average doctor of the sixteenth century was a compound of ignorance and knavery, well as commonly dose of pedantry. In all the literature of the period in question I cannot call to mind a detailed instance to the contrary. He is not a charlatan or a pedant in a mostly a knavery in a doctor's gown and cap, like the physician in Macbeth.

In 1629 there was published in London a curious volume entitled: " Micro-cosmographie, or a piece of the world discovered in essays and characters." It was an anonymous production, but the author was Dr. John Earle, afterward Bishop of Salisbury. Among his " characters " he has a physician and surgeon, and it must be admitted that they are not models of ethical conduct. Of the physician he says:

" His practice is some businesse at bed-sides, and his speculation an Urinall. Hee is distinguisht from an Empericke by a round velvet cap, and Doctors gowne, yet no man takes degrees more superfluously, for he is Doctor howsoever. He is sworne to *Galen* and *Hypocrates*, as University men to their statutes, though they never saw them, and his discourse is all Aphorisms, though his reading be onely *Alexis* of Piemont, or the Regiment of Health. The best cure he ha's done is upon his own purse, which from a leane sickliness he hath made lusty, and in flesh. His learning consists much in reckoning up the hard names of diseases, and the superscriptions of Gallypots in his Apothecaries Shoppe, which are rank't in his shelves and the Doctors memory. He is indeed only languag'd in diseases, and speakes Greeke many times when he knowes not. If he have beene but a by-stander at some desperate recovery, he is slandered with it, though he be guiltelesse; and this breeds his reputation, and that his Practice; for his skill is meerly opinion. Of all odors he likes best the smell of Urine, and holds *Vespatians* rule, that no gaine is unsavory. If you send this once to him, you must resolve to be sick howsoever, for he will never leave examining your Water till hee have shakt it into a disease. Then follows a writ to his drugger in a strange tongue, which hee understands though he cannot conster. If he see you himselfe, his presence is the worst visitation; for if he cannot heale your sickness, he will bee sure to helpe it. Hee translates his Apothecaries Shop into your Chamber, and the very Windowes and benches must take Phisicke."

As a rule, the physician of those times was a more flourishing man than the surgeon. There are proverbial expressions which indicate the general prosperity of the former. In a play by George Chapman, All Fools, 1605, III, 1, there is such an instance:

> Heaven, heaven, I see these politicians
> (Out of blind fortune's hands) are our most fools.
> 'Tis she that gives the lustre to their wits,
> Still plodding at traditional devices;
> But take 'em out of them to present actions,
> A man may grope and tickle 'em like a trout,
> And take 'em from their close dear holes as fat
> As a physician.

Of the surgeon he says:

" A Surgeon is one that has some business about his Building or little house of man, whereof Nature is as it were the Tyler, and hee the Playsterer. It is ofter out of reparations than an old Parsonage, and then he is set on worke to patch it againe. Hee deales most with broken Commodities, as a broken Head, or a mangled face, and his gaines are very ill got, for he lives by the hurts of the Common-wealth. He differs from a Physitian as a sore do's from a disease, or the sicke from those that are not whole, the one distempers you

within, and the other blisters you without. He complaines of the decay of Valour in these daies, and sighes for that slashing Age of Sword and Buckler; and thinkes the Law against Duels was made meerly to wound his Vocation. Hee had beene long since undone, if the charitie of the Stewes had not relieved him, from whom he ha's his Tribute as duely as the Pope, or a wind-fall sometimes from a Taverne, if a quart Pot hit right. The rareness of his custome mak[e]s him pittilesse when it comes: and he holds a Patient longer than our Courts a Cause. Hee tells you what danger you had beene in if he had staide but a minute longer, and though it be but a prickt finger, hee makes of it much matter."

Beaumont and Fletcher frequently introduce medical consultations in their plays, and " a physician " or " a surgeon " is nearly always to be found in the persons of the drama. It must be admitted, however, that those great writers had no admiration for the medical men of their time. They represent them either as pretenders or pedants, and they are held up to ridicule accordingly. In the play of Monsieur Thomas, 1639, II, 1, Francesco is taken with a fainting fit, and is cared for at first by his friends. One of them, Valentine, says:

> Come, lead him in; he shall to bed; a vomit,
> I'll have a vomit for him.
> *Alice.* A purge first;
> And if he breath'd a vein—
> *Val.* No, no, no bleeding;
> A clyster will cool all.

In scene 4 the same patient is the subject of a consultation:

> *Enter three physicians with an urinal.*
> *First Phys.* A pleurisy I see it.
> *Sec. Phys.* I rather hold it
> For *tremor cordis.*
> *Third Phys.* Do you mark the fæces?
> 'Tis a most pestilent contagious fever;
> A surfeit, a plaguy surfeit; he must bleed.
> *First Phys.* By no means.
> *Third Phys.* I say, bleed.
> *First Phys.* I say 'tis dangerous,
> The person being spent so much beforehand,
> And nature drawn so low; clysters, cool clysters.
> *Sec. Phys.* Now, with your favours, I should think a vomit,
> For take away the cause, the effect must follow;
> The stomach's foul and furr'd, the pot's unphlegm'd
> yet.
> *Third Phys.* No, no, we'll rectify that part by mild means;
> Nature so sunk must find no violence.

The third doctor, who proposes bleeding, objects to the emetic as a violent remedy. The expression that " the pot's unphlegm'd yet " would appear to mean that no phlegm appearing in the pot, it was to be supposed still in the stomach.

In the next act, Francesco, whose sole complaint is hapless love, is discovered in bed, the three physicians, reinforced by an apothecary, endeavoring to apply their remedies.

> *First Phys.* Clap on the cataplasm.
> *Francesco.* Good gentlemen—
> *Sec. Phys.* And see those broths there
> Ready within this hour.—Pray keep your arms in.
> The air is raw, and ministers much evil.

Fran.   Pray, leave me ; I beseech ye, leave me, gentlemen ;
　　　I have no other sickness but your presence ;
　　　Convey your cataplasms to those that need 'em,
　　　Your vomits, and your clysters.
Third Phys.   Pray, be rul'd, Sir.
First Phys.   Bring in the lettice-cap.—You must be shav'd, Sir,
　　　And then how suddenly we'll make you sleep.

The commentators have discussed in their ponderous manner the meaning of the " lettice-cap " in the foregoing passage. They suggest a lettice or lattice cap, one of open work, which is absurd ; there was a fur, too, called letice, but this would not cool the heated head. There is no doubt that lettuce leaves were applied to the shaven head as an appropriate remedy ; the hypnotic effect of the plant was much vaunted in those times. Its use, as well as that of its active principle, lactucarium, has gone by, but in country places in England a like treatment is still employed, and plantain leaves or a cabbage leaf with the morning dew on it is thought to be cooling to the head of a delirious person.

There is a play by Middleton, A Fair Quarrel, 1613, IV, 2, in which a surgeon is introduced, whose obstinate pedantry is amusingly contrasted with the impatient anger of the patient's sister. The Colonel lies wounded on his bed. His sister begins the interview :

Col.'s Sist.   Come hither, honest surgeon, and deal faithfully with a distressed virgin ; what hope is there ?

Surgeon.   Hope? chilis was scap'd miraculously, lady.

Col.'s Sist.   What's that, sir ?

Surg.   Cava vena ; I care but little for his wound i' th' œsophag, not thus much, trust me ; but when they come to diaphragma once, the small intestines, or the spinal medul, or i' th' roots of the emunctories of the noble parts, then straight I fear a syncope ; the flanks retiring towards the back, the urine bloody, the excrements purulent, and the dolour pricking or pungent.

Col.'s Sist.   . Alas, I'm ne'er the better for this answer.

Surg.   Now I must tell you his principal dolour lies i' th' region of the liver, and there's both inflammation and tumefaction feared ; marry, I make him a quadrangular plumation, where I used sanguis draconis, by my faith, with powders incarnative, which I tempered with oil of hypericon, and other liquors mundificative.

Col.'s Sist.   Pox a' your mundies frigatives ! I would they were all fired !

Surg.   But I purpose, lady, to make another experiment at next dressing with a sarcotic medicament made of iris of Florence ; thus, mastic, calaphena, opoponax, sarcocolla—

Col.'s Sist.   Sarco-halter ! what comfort is i' this to a poor gentlewoman? Pray tell me in plain terms what you think of him ?

Surg.   Marry, in plain terms I do not know what to say to him ; the wound, I can assure you, inclines to paralism, and I find his body cacochymic ; being then in fear of fever and inflammation. I nourish him altogether with viands refrigerative, and give for potion the juice of savicola dissolved with water cerefolium ; I could do no more, lady, if his best ginglymus were dissevered. —[*Exit.*

It seems the wound required to be twice cauterized ; the Surgeon says, Act V, 1 :

Marry, I must tell you the wound was fain to be twice corroded ; 'twas a plain gastrolophe, and a deep one ; but I closed the lips on't with bandages and sutures, which is a kind conjunction of the parts separated against the course of nature.

Most of the terms used by this learned Theban are readily understood, but one or two require a passing word. What is

meant by "chilis" I cannot tell ; the word is probably corrupt. The hypericon is St. John's wort, a vulnerary famous even to this day. I do not know what calaphena is unless it be a misprint for sagapenum. The dressing for the wound was to consist of orris root, gum mastic, calaphena, opoponax and sarcocolla ; three highly aromatic gum-resins held together by isinglass as a vehicle ; surely this was a good antiseptic application, though somewhat difficult to clean off. What *savicola* is I do not know, but the cerefolium is the chærophyllum or chervil.

Francis Beaumont, in his elegy on the death of the Countess of Rutland (the daughter of Sir Philip Sydney), indulges in a furious tirade against her physicians ; after exclaiming against their venality and ignorance, he gives this explanation of why they failed to save the countess, though they might cure common persons :

And I will show
The hidden reason why you did not know
The way to cure her : you believ'd her blood
Ran in such courses as you understood
By lectures : you believ'd her arteries
Grew as they do in your anatomies,
Forgetting that the State allows you none
But only whores and thieves to practise on ;
And every passage 'bout them I am sure
You understand, and only such can cure ;
Which is the cause that both yourselves and wives
Are noted for enjoying so long lives.
But noble blood treads in too strange a path
For your ill-got experience, and hath
Another way of cure. If you had seen
Penelope dissected, or the Queen
Of Sheba, then you might have found a way
To have preserv'd her from that fatal day.
As 'tis, you have but made her sooner blest,
By sending her to Heaven, where let her rest ;
I will not hurt the peace which she should have,
By longer looking in the quiet grave.

You will notice the reference to the provision made for dissection. "anatomies," as the poet terms them, by supplying the bodies of those dying in prison.

In the following spirited passage the ingratitude experienced by the Surgeon and the Soldier when the danger is past is well described :

What wise man,
That, with judicious eyes, looks on a soldier,
But must confess that fortune's swing is more
O'er that profession, than all kinds else
Of life pursued by men ?   They, in a state,
Are but as surgeons to wounded men,
E'en desperate in their hopes. While pain and anguish
Make them blaspheme and calm in vain for death,
Their wives and children kiss the surgeon's knees,
Promise him mountains, if his saving hand
Restore the tortur'd wretch to former strength ;
But when grim death by Æsculapius' art
Is frighted from the house, and health appears
In sanguine colors on the sick man's face.
All is forgot, and, asking his reward,
He's paid with curses, often receives wounds
From him whose wounds he cured ; so ungrateful,
Though of more worth and use, the soldier fares,
As it is too apparent. I have observ'd.

When horrid Mars, the touch of whose rough hand
With palsies shakes a kingdom, hath put on
His dreadful helmet, and with terror fills
The place where he, like an unwelcome guest,
Resolves to revel, how the lords of her, like
The tradesman, merchant, and litigious pleader,
And such like scarabs bred in the dung of peace,
In hope of their protection, humbly offer
Their daughters to their beds, heirs to their service,
And wash with tears their sweat, their dust, their scars ;
But when those clouds of war that menaced
A bloody deluge to the affrighted state,
Are, by their breath, dispersed, and overblown,
And famine, blood, and death, Bellona's pages,
Whipt from the quiet continent to Thrace ;
Soldiers, that, like the foolish hedge-sparrow,
To their own ruin, hatch this cuckoo, peace,
Are straight thought burthensome ; since want of means,
Growing from want of action, breeds contempt ;
And that, the worst of ills, falls to their lot,
Their service, with the danger, soon forgot.
                    —Massinger, The Picture, 1630, II, 2.

An older writer has tersely described the ingratitude of the recovered patient, in an epigram in Timothie Kendall's Flowers of Epigrams, 1577 :

OF PHISITIONS.

Three faces the Phisition hath
    first as an Angell he
When he is sought : next when he helpes
    a God he semes to be.
And last of all, when he hath made
    the sicke deseased well,
And asks his guerdon, then he semes
    an ougly Fiend of Hell.

Here is a scene from a play of the famous George Chapman. He was dramatist, poet, scholar, and his fine though rugged translation of Homer holds its own to this day with all other versions. The play is All Fools, 1605.

Dariotto has received a slight wound in the head in a chance encounter, when enter Page with Francis Pock the surgeon ; Valerio says :

What thinkest thou of this gentleman's wound, Pock ; canst thou cure it, Pock ?
    Pock.   The incision is not deep, nor the orifice exorbitant ; the pericranion is not dislocated. I warrant his life for forty crowns, without perishing of any joint.
    Dariotto.   'Faith, Pock, 'tis a joint I would be loth to lose for the best joint of mutton in Italy.

(Note.   This is a free allusion.   A mutton, or laced mutton, was a common term for a buona roba or lady of pleasure.)

Rinaldo.   Would such a scratch as this hazard a man's head ?
    Pock.   Ay, by 'r lady, Sir : I have known some have lost their heads from a less matter, I can tell you ; therefore, Sir, you must keep good diet ; if you please to come home to my house till you be perfectly cured, I shall have the more care on you.
    Valerio.   That 's your only course to have it well quickly.
    Pock.   By what time would he have it well, Sir ?
    Dariotto.   A very necessary question ; canst thou limit the time ?
    Pock.   Oh, Sir, cures are like causes in law, which may be lengthened or shortened at the direction of lawyer ; he can either keep it green with replications or rejoinders, or sometimes skin it fair a th' outside for fashion's sake ; but so he may be sure 'twill break out

again by a writ of error, and then has he his suit new to begin ; but I will covenant with you, that by such a time I'll make your head as sound as a bell ; I will bring it to suppuration, after I will make it coagulate and grow to a perfect cicatrice, and all within these ten days, so you keep a good diet.
    Dariotto.   Well, come, Pock, we 'll talk further on 't within.

A surgeon of rather more firmness is found in Beaumont and Fletcher's play of The Chances, 1621, III, 2. Antonio, who has received several wounds, is a most unruly patient, demanding wine, decrying the food provided for him, and abusing his surgeon, who, he says, has so dressed his wounds that he looks like the figure of the signs of the zodiac in the almanacks ; one of his friends remonstrates with him :

            Fy, Antonio,
            You must be governed.
Antonio.   He has given me a damned glyster
            Only of sand and snow-water, gentlemen,
            Has almost scowred my guts out.
Surgeon.   I have given you that, Sir,
            Is fittest for your state.
Antonio.   And here he feeds me
            With rotten ends of rooks, and drowned chickens,
            Stewed pericraniums and pia-maters ;
            And when I go to bed (by Heaven 'tis true, gentlemen),
            He rolls me up in lints with labels at 'em,
            That I am just the man i' th' almanack,
            My head and face is Aries' place.

This ungovernable patient insists on having music and song while he is "opened," as he terms it, that is, has his wounds dressed. He enquires of the surgeon how long he will take to cure him, who replies "forty days"; on which Antonio exclaims :

I have a dog shall lick me whole in twenty,

            Good man-mender,
            Stop me up with parsley, like stuffed beef,
            And let me walk abroad.

Amongst the more or less occult mysteries of medicine the weapon-salve offered a tempting bait to the credulous and a ready profit to the quack doctor who furnished it.   Henry Glapthorne, a dramatist almost forgotten, wrote a play in 1635 in which Doctor Artlesse and his man Urinall are important personages.   Urinall, who is a ready-witted knave, has met with a young Dutchman named Sconce, who is anxious to figure among the swaggering blades of the town, but being rather lacking in courage, he has purchased a box of the famous salve from the aforesaid Urinall.   The scene thus begins :

Sconce.   But you are certaine Urinall this oyntment is Orthodoxall ; may I without error in my faith believe this same the weapon salve Authenticall ?
    Urin.   Yes, and infallibly the creame of weapon salves, the simples which doe concurre to th' composition of it, speake it most sublime stuffe ; tis the rich Antidote that scorns the steele, and bids the iron be in peace with men, or rust : Aurelius Bombastus Paracelsus, was the first inventer of this admirable Unguent.
    Sconce.   He was my Country-man, and held an Errant Conjurer.
    Urin.   The Devil he was as soone : an excellent Naturallist, & that was all upon my knowledge, Mr. Sconce ; and tis thought my master comes very neare him in the secrets concerning bodies Physicall, as Herbes, Roots, Plants vegetable and radicall, out of

whose quintessence, mixt with some hidden causes, he does extract this famous weapon salve, of which you are now master.

Urinall continues to regale the ears of Master Sconce with wonderful stories of the cures effected by anointing the weapon which had inflicted the wound, and ends with a most convincing incident. A great explosion of gunpowder had taken place on some celebration and threescore persons were blown up, yet, says Urinall:

> Thirty of their
> lives my Master saved.

Sconce. Rarer, and rarer yet : But how, good Urinall ?
Urinall. He dressed the smoake of the powder as it flew up, Sir, and it healed them perfectly.

Later on Sconce has occasion to use the famous remedy after receiving a slight wound in the arm, and a pleasant discussion takes place in which he and his friend Fortresse, with Doctor Artlesse and a gentleman named Freewit, took part. Freewit begins:

> I have seen experience of this weapon salve, and by its
> Most mysterious working knowne some men hurt, past the
> Helpe of surgery recover'd. . . . Yet I cannot
> With my laborious industry invent
> A reason why it should doe this, and therefore
> Transcending naturall causes, I conclude
> The use unlawfull.

Doct. But pray sir, why should it be unlawfull?
Free. Cause Conscience and religion disallow
> In the recovery of our impair'd healths,
> The assistance of a medicine made by charms,
> Or subtle spells of witchcraft.

Doct. Conceive you this to be compounded so?
Free. Ile prove it, mas'er Doctor.

> Yet to avoide a tedious argument,
> Since our contention 's only for discourse,
> And to instruct my knowledge, pray tell me,
> Affirme you not that this same salve will cure
> At any distance (as if the person hurt
> Should be at Yorke) the weapon, dres'd at London,
> On which his blood is.

Doct. All this is granted 'twill.

Free. Out of your words, sir, Ile prove it Diabolicall, no cause
> Naturall begets the most contemn'd effect,
> Without a passage through the meanes ; the fire
> Cannot produce another fire until
> It be apply'd to subject apt to take
> Its flaming forme, nor can a naturall cause,
> Worke at incompetent space : how then can this
> Neither consign'd to th' matter upon which
> Its operation is to cause effect,
> Nay at so farre a distance, worke so great
> And admirable a cure beyond the reach
> And law of nature ; yet by you maintain'd,
> A Naturall lawful agent, what dull sence can credit it?

Doct. Sir, you speake reason, I must confesse, but every cause
> Workes not the same way ; we distinguish thus :
> Some by a Physicall and reall touch
> Produce : So Carvers hewing the rough Marble,
> Frame a well polish'd statue : but there is
> A virtuall contact too ; which other causes

Imploy in acting their more rare effects.
> So the bright Sun does in the solid earth,
> By the infusive vertue of his raies,
> Convert the sordid substance of the mould
> To Mines of Mettall, and the piercing ayre
> By cold reflexion so ingenders Ice ;
> And yet you cannot say the chilly hand
> Of ayre, or quickning fingers of the Sunne,
> Really touch the water or the earth.
> The Load-stone so by operative force,
> Causes the Iron which has felt his touch,
> To attract another Iron ; nay, the Needle
> Of the ship guiding compasse, to respect
> The cold Pole Articke ; just so the salve workes,
> Certain hidden causes convey its powerfull
> Vertue to the wound from the annointed
> Weapon, and reduce it to welcome soundnesse.

Free. This, Mr. Doctor, is
> A weake evasion, and your purities
> Have small affinity ;
>
> .
>
> But that this,
> This weapon salve, a compound, should affect
> More than the purest bodies can, by wayes
> More wonderfull than they doe, as apply'd
> Unto a sword a body voyd of life,
> Yet it must give life, or at least preserve it.

.Doct. You mistake, it does not,
> Tis the blood sticking to the sword atchieves
> The cure : there is a reall sympathy
> Twixt it, and that which has the juyce of life,
> Moystens the body wounded.

Free. You may as well
> Report a reall sympathy betweene
> The nimble soule in its swift flight to heaven,
> And the cold carkasse it has lately left,
> As a loath'd habitation ; blood, when like
> The sap of Trees, which weepes upon the Axe
> Whose cruell edge does from the aged Trunke
> Dissever the green Branches from the Veines,
> Ravish'd, forgoes his native heate, and has
> No more relation to the rest, than some
> Desertlesse servant, whom the Lord casts off,
> Has to his vertuous fellowes.

Among other somewhat unusual medical treatment, the inspiring courage in a cold-blooded youth by appropriate diet and training is thus told of in Love's Cure, III, 2, 1622:

Piorato. Then for ten days (he) I diet him,
> Only with burnt pork, sir, and gammons of bacon :
> A pill of caviary now and then
> Which breeds choler adust, you know

Bobadillo. 'Tis true.
Piorato. And to purge phlegmatic humours and cold crudities,
> In all that time he drank me *aqua-fortis*.
> And nothing else but

Bobadillo. *Aqua-ritæ*, signior,
> For *aqua-fortis* poisons.

Piorato. *Aqua-fortis*,
> I say again ; what's one man's poison, signior,
> Is another's meat or drink.

Bobadillo. Your patience, Sir ;
> By your good patience, h' as a huge cold stomach

Piorato.   I fir'd it, and gave him then three sweats,
      In the Artillery Yard, three drilling days ;
      And now he'll shoot a gun, and draw a sword,
      And fight, with any man in Christendom.
Bobadillo.   A receipt for a coward ! I'll be bold, Sir,
      To write your good prescription.
Piorato.   Sir, hereafter
      You shall, and underneath put *probatum*.

In introducing the subject of the venereal disease as next in order for illustration, it is right to say a few words as to the value of such illustrations for critical or historical purposes. It must be borne in mind that satirical writers or dramatic poets would be naturally prone to treat the matter from a ludicrous point of view.   An element of the comic seems to be an essential part of familiar descriptions of the consequences of engaging in the wars of Venus, and we should not, therefore, accept without some caution the canons of treatment laid down in the plays.   Nevertheless, there are so many allusions to the " wood," as it was termed, meaning guaiacum, to the sweating process known as "the tub," to special forms of diet, as well as to manifestations of the ravages of the disease, that altogether it forms a very curious illustration of the popular belief as to the widespread nature of the poison and its appropriate treatment.   Hensler, referring to the lack of any description of disease of the genital organs, produced by coitus, in such writers as Horace, Martial, or Juvenal, makes use of the curious argument that in his time neither amorous nor serious poets were accustomed to allude to such an awkward subject, *and yet the disease existed.* Certainly Martial cannot be supposed to have been restrained from saying what he pleased by any motives of delicacy, and considering the minuteness with which he details the physical effects of pederasty, it is a fair argument that had he known of any contagious disease of the genital organs proper, the result of coition, he would have lavished his wit upon so tempting a subject in endless epigrams.   But of the existence of a very general knowledge of venereal disease in the sixteenth and seventeenth centuries in England, the following quotations will leave no doubt.

It is not, of course, my intention to enter into the vexed question of the first appearance of syphilis.   Whether it can be identified in classic, oriental, or bible writings—whether it originated at the siege of Naples, or was brought from the West Indies by the Spanish discoverers—all of this has been debated vehemently, and it is perhaps a still unsettled question.   I must, however, remind you of certain dates.   The year 1493, during which the siege of Naples was progressing and Charles VII arrived to take command, has been usually taken to be the year in which the disease became virulent and epidemic.   In 1494 it was spoken of as *morbus gallicus,* and as early as 1508 guaiacum was being used as a remedy for it.

The earliest allusion to the scourge which I have met with in general literature is in an old Scottish poem called Rowil's Cursing.   It forms part of the Bannatyne MSS. dating from 1492 to 1503, and is published in Sibbald's " Chronicle of Scottish poetry from the thirteenth century to the union of the Crowns," Edinb., 1802, 4 vols.   The passage in question is at p. 331 of Vol. I :

      Now cursit and wareit be thair werd
      Quhyll thay be levand on this erd ;
      Hunger, sturt, and tribulation,
      And never to be without vexation. . . .
      The paneful gravel and the gutt,
      The gulsoch that thay nevir be but,
      The stranyolis, and the grit glengor,
      The hairschott lippis them before.

In plain English it is as follows :

      Now cursed and accursed be their fate,
      While they be living on this earth ;
      Hunger, strife, and tribulation
      And never to be without vexation. . . .
      The painful gravel and the gout,
      The jaundice that they never be without,
      The strangury and the *great glengor.*

The *gulsoch* is the jaundice ; in Low Dutch it is still called *gheelsucht,* or yellow disease.   *Stranyolis* is from *strang,* old Scotch for urine which has been retained until it is *strang* or malodorous.   The term which concerns us is the *great glengor.* Jamieson in his Scottish Dictionary defines it under various spellings, as *lues venerea,* derives it from old French *gorre,* a sow, and gives the doubtful suggestion that it might have been *glandgore.*   How the word sow came to be applied in this connection I cannot explain.   You will doubtless remember a similar etymology for the Greek word indicating the especially faulty organ.

In the French and English dictionary of Randle Cotgrave, first published in 1611, is the following definition under *Gorre,* f. a sow (also the French pockes. *Norm.*); also bravery, gallantness, gorgeousness, etc.   *Femmes à la grande gorre.* Huffing or flaunting wenches ; costlie or stately dames.

This is not the only instance of the application of the name of an animal to the venereal disease.   I shall shortly have to speak of the " Winchester goose," and in the campaign of the British army in the Peninsula in the Napoleon wars the name of " the black lion " was given to an extremely destructive form of syphilitic ulceration.

It is not surprising that the vindictive Scotchman should have included the " grand-gorre " among his curses, and the unsavory objurgation, in the shape of ' pox take you,' or ' pox on it,' survived to quite recent times.   The word did not always mean the venereal disease.   Thus Dr. Donne writes to his sister : " At my return from Kent I found Pegge had the poxe ; I humbly thank God it hath not disfigured her."   The prefix of great, the great-pox, in contradistinction to the small-pox was common enough, and in France *la grande verolle* and *la petite verolle* were in like contrast.   You will remember the *mot* of Louis XIV when it was announced in the circle that an actress famous for her amours had just died of the small-pox.   " It was very modest of her," said the king.

The nomenclature of the venereal disease is very extensive. I shall only touch upon those names referred to in the poets. In a play by Nash, Pierce Pennilesse, 1592, is this passage : " But *cucullus non facit monachum*—'tis not their newe bonnets will keepe them from the old boan-ache."   This most appropriate name is employed also by Shakespeare.   Words or allusions indicating its French origin are endless, and its Italian source is not forgotten.   Florio in his Worlde of

Wordes, 1598, has the verb *infranchiosare*, to infect or to be infected with the French poxe; to frenchifie. And on the other hand, the Frenchman Motteux, in his translation of Rabelais, which is a perfect treasury of quaint old English, makes Friar John say: "He looks as if he had been struck over the nose with a Naples cowl-staff." It is amusing to observe how these compliments are reciprocated. In a translation of the Colloquies of Erasmus, by Sir Roger L'Estrange, is this passage: "*C.* Your chin, too, looks as it were stuck with rubies. *S.* That's a small matter. *C.* Some blow with a French faggot-stick (as they say). *S.* Right, it was my third clap, and it had like to have been my last."

There is a name for syphilis of which I have met with but one instance, namely, *the marbles.* I presume it to have arisen from the chain of enlarged glands in the groin characteristic of the disease. In the Harleian Miscellanies is a play entitled A Quip for an Upstart Courtier, 1592, and in it one says to the doctor: "Neither doe I frequent whorehouses to catch the marbles, and so to prove your patient."

"The scab" was a very common appellation, often used vituperatively, as in some lines of that most charming lyric poet, Robert Herrick. It refers to one of his books and is addressed

<div align="center">

To the Sowre Reader.

If thou dislik'st the piece thou light'st on first,
Thinke that, of all that I have writ, the worst.
But if thou read'st my booke unto the end,
And still dost this and that verse reprehend,
O perverse man! If all disgustfull be,
The extreme scabbe take thee and thine, for me.

</div>

Again, in The Sea Voyage, by Beaumont and Fletcher:

Is thy skin whole? Art thou not purl'd with scabs?
No ancient monuments of Madam Venus?

And in The Dutch Courtezan by Marston:

Is a great lord a foole, you must say he is weake. Is a gallant pocky, you must say he has the court-skab.

One of the oddest and oldest terms in the copious nomenclature of the venereal disease is the *Winchester goose.* There is no doubt as to its origin. In the early days of London the Bankside was a continuous row of brothels near the river, which were under the jurisdiction of the Bishop of Winchester, and the victim who suffered the usual consequences of a visit to this tainted locality was called a Winchester goose. In course of time the term was applied to the disease itself, and the allusions to it in the old writers are very frequent. John Taylor, the Water Poet, who was intimately acquainted with all river-side customs and phrases, calls it

A groyne bumpe, or a goose from Winchester,

and the Nomenclator, one of the earliest English dictionaries, published in 1585, defines it as "a sore in the grine or yard, which if it come by letcherie, it is called a Winchester goose, or a botch." In Ben Jonson's Underwoods is this passage:

And this a sparkle of that fire let loose
That was rak'd up in the Wincestrian Goose,
Bred on the Bank in times of popery
When Venus there maintain'd the mystery.

Shakespeare has more than one allusion to the goose of Winchester. In an early manuscript entitled The Pennyless Parliament, preserved in the Harleian Miscellany, it is spoken of as the pigeon, and a satirical advice follows for the means of avoiding it: "Those that play fast and loose with women's apron-strings may chance make a journey for a Winchester pigeon; for prevention thereof, drink every morning a draught of *noli me tangere,* and by that means thou shalt be sure to escape the physician's purgatory." In Webster's play of Westward hoe! 1607, Act III, Scene 3, there is an elaborate account of the origin of the term Winchester goose, but it is too lengthy for present quotation.

There are many and even copious allusions in the dramatists and poets to the treatment of syphilis by two methods: the one by sweating in the tub, and the other by guaiacum administered in decoction, the two methods being combined, or the latter following the former.

The earliest representation of the famous tub is, I believe, in the works of Ambrose Paré, page 598 of the edition of 1575. It is rather a cask than a tub. The patient was seated inside on a perforated stool beneath which hot bricks or stones were placed. Through a small trapdoor in the side of the tub a mixture of vinegar and brandy was thrown upon the heated bricks and the steam was confined by a sheet fastened round the patient's neck. In England the common tub used for salting meat, 'powdering' it, as the term then was, seems to have been employed. The humorous allusions to this double use are frequent. In Measure for Measure, the clown, speaking of Mistress Overdone, the bawd, says: "Troth, Sir, she hath eaten up all her beef, and she is herself in the tub." The writer of an article in the January number of Harper's Magazine, on Shaksperean phrases in use in the United States, is much puzzled by this phrase of "in the tub," being evidently unaware of its meaning. He suggests that the expression of "in the soup" has like application. In Timon of Athens, IV, 3, is this passage:

<div align="center">

bring down rose-cheeked youth
To the tub-fast and the diet.

</div>

Sometimes an oven, or a hole in the ground, was used for the sweating, and in every case a strict diet was enforced. Dry food, and above all "burnt" or overdone mutton, cut by choice from the rack or neck, was alone to be had. The quotations will give all this in full. The first is from Beaumont and Fletcher's play of The Knight of the Burning Pestle, 1613, III, 5. It is, I think, intended partly as a burlesque on the style of Spenser's Faerie Queene. A knight and lady are imprisoned in a cave where dirty and ………… a giant. The knight had carried off his "lady dear" from her friends in Turnbull Street, a locality like the Bankside, notorious for houses of prostitution. He begins:

I am an errant-knight that follewed arms
With spear and shield; and in my tender yeares
I stricken was with Cupid's fiery shaft,
And fell in love with this my lady dear,
And stole her from her friends in Turnbull-Street;
And bere her up and down from town to town,
Where we did eat and drink and musie hear,
Till at the length at this unhappy town
We did arrive and coming to this cave,

This beast us caught, and put us in a tub
Where we this two months sweat, and should have done
Another month if you had not reliev'd us.
  Woman. This bread and water hath our diet been,
Together with a rib cut from a neck
Of burned mutton ; hard hath been our fare ;
Release us from this ugly giant's snare.
  Man. This hath been all the food we have receiv'd ;
But only twice a day, for novelty,
He gave a spoonful of this hearty broth
To each of us through this same slender quill.
                              (*Pulls out a syringe.*)

In the comedy of Honest Man's Fortune, by the same authors,
1613, V, 3, there is this reproach to a libertine :

    All women that on earth do dwell, thou lovest,
    Yet none that understand love thee again,
    But those that love the spital. Get thee home,
    Poor painted butterfly ! Thy summer's past ;
    Go, sweat, and eat dry mutton.

So of a similar gallant in Middleton's Michaelmas Term,
1607, I, 1 :

    He'll be laid shortly ;
    Let him gorge venison for a time, our doctors
    Will bring him to dry mutton.

The loss of hair from syphilitic disease did not escape the
observation of the satiric poets, and the allusions to French
crowns and nightcaps are endless. There is a poem called
" A fig for Momus," published in 1595. I have not seen it,
but quote from Beloe, who says it is the oldest satire in the
language.

    Last day I chaunst in crossing of the street,
    With Diffilus the innkeeper to meet.
    He wore a silken nightcap on his head,
    And looked as if he had been lately dead ;
    I askt him how he far'd ; not well, quoth he,
    An ague this two months hath troubled me.
    I let him passe, and laught to hear his skuce,
    For I knew well he had the pox by Luce,
    And wore his night-cappe ribbin'd at the ears,
    Because of late he swet away his heares.

In Your Five Gallants, Middleton, 1608, I, 1 :

" He's in his third sweat by this time, sipping of the doctor's
bottle, or picking the ninth part of a rack of mutton dry-
roasted, with a leash of nightcaps on his head like the pope's
triple crown, and as many pillows crushed to his back."

George Farquhar, the dramatist, in one of his poems speaks
more hopefully to one who has been in the " powdering tub."

    You will revive, the pox expire,
    Then rise like phœnix from the fire.
    The metal's stronger that's once soldered,
    And beef keeps sweeter once 'tis powdered.

Many of my quotations speak of a " Cornelius tub," or Cor-
nelius's tub. How the name came to be applied, or who Cor-
nelius was, I have been unable to discover. Sometimes it is
" Cornelius's dry-fat," but a dry-fat, or dry-vat, is an old-
fashioned name for a box or cask.

In Armin's Nest of Ninnies, 1608, one says of the students:
" And when they should study in private with Diogenes in his
cell, they are with Cornelius in his tub."

It was natural that the old story of Diogenes and his tub
should present an opportunity for the gibe of the satirist. In
Cotgrave's English Treasury of Wit and Language, 1655, p.
221, is this epigram :

    As for Diogenes, that fasted much,
    And took his habitation in a tub,
    To make the world believe he loved a strict
    And severe life, he took the dyet, sir, and in
    That very tub sweat for the French disease.
    And some unlearn'd apothecary since
    Mistaking 's name, call'd it Cornelius tub.

How early the system of treating syphilis by sweating was
introduced cannot, I suppose, be settled, but Rabelais has a
characteristic reference to it, book II, chapter 2, which con-
tains also a satisfactory explanation of how the sea was made
and came to be salt. I quote Motteux's translation, which in
this instance is exact:

" The earth at that time was so exceedingly heated that it
fell into an enormous sweat, yea, such an one that made it
sweat out the sea, which is therefore salt, because all sweat is
salt ; and this you cannot but confess to be true if you will
taste of your own, or of those that have the pox when they
are put into a sweating ; it is all one to me." This was writ-
ten before 1532.

There is a curious example in connection with the diet of
how an old system may put on a new birth. In 1817 a
Frenchman named Gaudy wrote a thesis in which he highly
lauded the treatment of syphilis by the dry method, namely,
dry food and but little of it. The treatise attracted but little
notice, but about thirty years later this method of treatment
was tried at the Hôtel-Dieu of Marseilles with some success.
It was called the Arabic method, as the secret of it had been
communicated, so it was said, to the hospital surgeons by an
Arab. The diet consisted exclusively of dry biscuits, nuts,
dried almonds, figs and raisins. A tisan made from sarsapa-
rilla, China root and cloves was freely given, and a mercurial
pill was administered thrice daily. The latest account of this
treatment was written in 1860. Two hundred years before,
the famous Mrs. Aphra Behn wrote what she termed "A
letter to a brother of the pen in tribulation," and you will see
how closely the descriptions agree as to the diet. The word
tabernacler was applied to street preachers of the time, such as
the notorious Orator Henley, who were accustomed to preach
from a cask or tub:

    Poor Damon ! art thou caught? Is't even so?
    Art thou become a *Tabernacler* too?
    When sure thou dost not mean to preach or pray,
    Unless it be the clean contrary way ;
    This holy time * I little thought thy sin
    Deserv'd a tub to do its penance in.
    O, how you'll for th' Egyptian flesh-pots wish,
    When you're half famish'd with your lenten dish,
    Your almonds, currants, biscuits, hard and dry,
    Food that will soul and body mortify ;
    Damned penitential drink, that will infuse
    Dull principles into thy grateful muse.

There is yet another powerful method of sweating which

---

* Lent.

would have greatly pleased the late Doctor Hewson, the
enthusiastic advocate of the dry-earth treatment.   It is from
D'Avenant's play of The Wits, 1636, Act IV, Scene 1:

> Though I endured the diet and the flux,
> Lay seven days buried up to the lips like a
> Diseas'd sad Indian, in warm sand, whilst his
> Afflicted female wipes his salt foam off
> With her own hair, feeds him with buds of guacum
> For his sallad, and pulp of salsa for
> His bread ; I say all this endur'd, would not
> Concern my face.*   Nothing can decline that.

Salsa was probably sassafras, the Spanish name for which
was *salsafras*.

I shall conclude these illustrations of the history of syphilis
with one capital scene from The Picture, by Massinger, 1630,
Act IV, Scene 2.   Ubaldo and Ricardo are both in love with
Sophia, who first listens to Ubaldo's account of his rival.

Sophia.   How ! is he not wholesome ?
Ubaldo.   Wholesome ! I'll tell you for your own good ; he is
  A spittle of diseases, and, indeed,
  More loathsome and infectious ; the tub is
  His weekly bath ; he hath not drank this seven years,
  Before he came to your house, but composition
  Of sassafras and guaicum ; and dry mutton
  His daily potion ; name what scratch soever
  Can be got by women, and the surgeons will resolve you,
  At this time, or that, Ricardo had it.
Sophia.   Bless me from him !
Ubaldo.   'Tis a good prayer, lady,
  It being a degree unto the pox,
  Only to mention him ; if my tongue burn not, hang me,
  When I but name Ricardo.

After Ubaldo has been dismissed by Sophia, who is enter-
taining both him and his friend, Ricardo, with illusive hopes,
Ricardo is introduced, and proceeds to traduce his friend, as
follows :

Ricardo.   He did not touch your lips?
Sophia.   Yes, I assure you.
  There was no danger in it?
Ricardo.   No ! eat presently
  These lozenges of forty crowns an ounce,
  Or you are undone.
Sophia.   What is the virtue of them?
Ricardo.   They are preservatives against stinking breath
  Rising from rotten lungs.
Sophia.   If so, your carriage
  Of such dear antidotes, in my opinion,
  May render yours suspected.
Ricardo.   Fie ! no ; I use them
  When I talk with him, I should be poisoned else.
  But I'll be free with you ; he was once a creature,
  It may be of God's making, but long since
  He is turn'd to a druggist's shop ; the spring and fall
  Hold all the year with him ; that he lives he owes
  To art, not nature ; she has given him o'er.
  He moves like the fairy king, on screws and wheels,
  Made by his doctor's recipes, and yet still
  They are out of joint, and every day repairing.

---

* Make me look concerned.

He's acquainted
  With the green-water, and the spitting pill 's
  Familiar to him ; in a frosty morning
  You may thrust him in a pottle-pot ; his bones
  Rattle in his skin, like beans toss'd in a bladder.
  If he but hear a coach, the fomentation,
  The friction with fumigation, cannot save him
  From the chine-evil.   In a word, he is
  Not one disease, but all ; yet, being my friend,
  I will forbear his character, for I would not
  Wrong him in your opinion.

Distinct allusions to gonorrhœa are, as might be supposed,
comparatively infrequent in the older dramatists, though com-
mon enough in the plays of the 18th century.   How early
syringes were employed in the treatment of the disease I do
not know, but in most of the instances in which they are
named in the drama, " birding pills " are also spoken of, and
the " green-water " is frequently alluded to.   The term
" bird " was a familiar one in those days to denote the venal
fair who bestowed her favors, with their not infrequent penal-
ties, upon all comers.   The expressions " to go a birding,"
" birding pills " and " birding syringes," which are often used,
have obvious meanings.   What the " birding-pill " contained
I cannot say, but it was probably composed of Chio turpen-
tine ; the " spitting-pill " of course consisted of mercury in
some form, generally the old-fashioned blue pill.   The " green-
water " has a rather interesting history.   It was a decoction
made from the herb clary, the *Salvia sclarea*.   The various
plants of the sage family have mostly disappeared from phar-
macopœias, but they are still used in household medicine.
Captain John G. Bourke, 3d Cavalry, in a recent article on
the Folk-foods of the Rio Grande Valley, tells how he once
arrived at a convent, hot, thirsty, and exhausted, after a long
ride, and was refused the cold water which he demanded.
The good priest said that it was only Americans who would
drink cold water when heated, and sent for some " chia "
seeds and steeped them in water which became speedily
mucilaginous.   This was administered to him in small quant-
ities, and he declares that its effect in removing his thirst and
fever and restoring his voice was surprising.   He did not know
what plant the seeds came from.   Now *chia* is the name given
to the seeds of more than one species of wild sage, and it is a
popular remedy in the form of a tea in the States on the
Mexican border.   The " green-water " of the poet was made
from the heads of the clary plant, and doubtless contained
some mucilage from the seeds.   As a demulcent it would rank
with the barley water and flaxseed tea which are still ordered
as diet drinks for the unlucky victims of " birding."

In the following passage from The Chances, 1621, III, 1,
Don John has offended Dame Gillian, who old woman
retorts upon him thus :

Gillian.   Well, Don John,
  There will be times again soon, will and bedtime,
  What 's good for a curiosity in the poultice
  Oh, the green water, mother.
Don John.   Doting take you !
  Do you remember that
Gillian.   " Clary, sweet mother, clary !"
Frank.   Are you satisfied !

Gillian.   "I'll never whore again; never give petticoats
                And waistcoats at five pounds a piece! Good mother!
                Quickly, mother!" Now mock on, Son.

Later on Dame Gillian says of her hopeful charge:

                He's ne'er without a noise of syringes
                In's pocket (those proclaim him), birding-pills,
                Waters to cool his conscience, in small vials,
                With thousand such sufficient emblems.—[III, 4.

The term "carnosity of the bladder" is significant of the supposed pathology of gonorrhœa.

Sage is also recommended as a spring medicine:

                Now butter with a leaf of sage, to purge the blood;
                Fly Venus and phlebotomy, for they are neither good."
                                —Knight of the Burning Pestle, III, 4.

There is an amusing passage in a play by Shadwell, The Virtuoso, 1676, which in a coarse way exhibits the manners of the time at the theatres. Speaking of certain young bloods, one says:

"Such as come drunk and screaming into a play house, and stand upon the benches, and toss their full perriwigs and empty heads, and with their shrill unbroken pipes cry, *Damme, this is a damn'd play. Prythee let's to a whore, Jack.* Then says another with great gallantry, pulling out his box of pills, *Damme, Tom, I am not in a condition; here's my turpentine for my third clap;* when you would think he was not old enough to be able to get one."—I, 1.

We complain somewhat in our own day of theatre ill manners, but such an exhibition of insolent debauchery as that just quoted seems almost incredible. That it was not uncommon, even at a later period, is shown by a passage in the play of The English Friar, by John Crowne, 1690, Act I, Scene 1, where Lord Stately says:

"Ay, there's a folly reigns among us; your young fellows now are proud of having no manners, no sense, no learning, no religion, no good nature; and boast of being fops and sots and pox'd in order to be admired."

Closing the references to the venereal disease with this quotation, I shall occupy a few moments more of your time with some passages illustrating what I have termed miscellaneous medical subjects.

The domestic treatment for hysteria, or a fit of the mother, as they termed it, was not lacking in potency. In The Magnetic Lady, by Ben Jonson, 1632, V, 1, Item says:

                What had she then?
Needles.   Only a fit of the mother;
                They burnt old shoes, goose-feathers, asafœtida,
                A few horn-shavings, with a bone or two,
                And she is well again about the house.

Here is a forcible application of the frequent term of "good surgery" as applied to the body politic. It is from The Muse's Looking Glass, a play by Randolph, 1638:

                The land wants such
                As dare with rigour execute her laws;
                Her fester'd members must be lanc'd and tented.
                He's a bad surgeon that for pity spares
                The part corrupted till the gangrene spreads
                And all the body perish. He that's merciful
                Unto the bad, is cruel to the good.

                The pillory must cure the ear's diseases;
                The stocks the foot's offences; let the back
                Bear her own sin, and her rank blood purge forth
                By the phlebotomy of a whipping-post.

Clysters are more often mentioned in French than in English plays. In a comedy published in Paris in 1683, termed *Le Mercure galant*, there is a droll name given to the apothecary. This functionary, as we know, was accustomed to carry his immense syringe duly charged and resting on an appropriate tray, with ostentatious publicity to the patient's residence. Kneeling at the bedside while the patient discreetly presented what an old writer terms "his back face," the compound, consisting mainly of starch and castor oil, was administered. In the play referred to, Oronte says (I give it in English): "Who is this man? Has he any calling?" M. Michaud, the man in question, replies: "Between ourselves, Sir, my grandfather was a kneeling musketeer" (*mousquetaire à genoux*). "What sort of a charge was that?" says the other. "Why," replies Michaud, "it is what the vulgar in their common language call an apothecary."

Florio in his Italian dictionary, 1578, referring to the well known story in Pliny's Natural History that the ibis gives himself a clyster and voids himself upwards, adds the embellishment that the bird uses salt water from preference, and that Hippocrates from watching his proceeding first learned how to give clysters.

A curious precaution seems to have been taken by certain careful fine ladies, previous to attending a long ceremony. The usher says:

            Make all things perfect; would you have these ladies
            They that come here to see the show, these beauties
            That have been labouring to set off their sweetness,
            And wash'd, and curl'd, perfumed, and taken glisters
            For fear a flaw of wind might overtake 'em,
            Lose these and all their expectations?—
            Madams, the best way is the upper lodgings;
            There you may see at ease.
                                —Humorous Lieutenant, I, 1.

The learned Porson was credited with the authorship of a bit of humor in mock Greek, familiar to us all in our student days, in which the proportion between the secretion of tears and of urine was nicely adjusted, an excess of the former diminishing the supply of the latter. There is a medical application of the same fancy in The Scornful Lady, of Beaumont and Fletcher, 1616, III, 2. An angry lover says:

            But if I come,
            From this door till I see her will I think
            How to rail vilely at her; how to vex her,
            And make her cry so much that the physician,
            If she falls sick upon it, shall want urine
            To find the cause by, and she, remediless,
            Die in her heresy.

In that capital piece of fun, "Father Tom and the Pope," the priest, after many potations, is obliged to ask for a certain utensil which he denominates a "looking-glass." The term is not uncommon in the old plays, though its origin was not evident. A passage in one of Webster's plays, The Thracian Wonder, 1661, IV, 2, seems to offer an explanation:

Antonio. A looking-glass, I say.

Claudio. You shall, sir, presently; there's one stands under my bed.

Antonio. Why, that's a jordan, fool.

Claudio. So much the better, Father; 'tis but making water in 't, and then you may behold your sweet phisnomy in the clear streams of the river Jordan.

There is, however, a different meaning given to it in a curious work written by a surgeon, namely Festivous Notes to Don Quixote, by Edmund Gayton, 1654, p. 236: "The men running to the close-stools, the women to the looking or leaking-glasses."

The etymology of jordan is also uncertain. In old French, *jar* means urine, and in Armorican, *dourden*, and in analogous Welch *dur dyn*, have the same signification.

There is, I believe, still to be seen in the apothecaries' shops what is known as *sal prunella*, or alum-nitre, as it was sometimes called. It consists of nitrate of potassium chiefly, and was used as a remedy for a sore throat, small fragments of it being allowed to dissolve slowly in the mouth. In the following passage from The Duchess of Malfy, 1623, it is alluded to, coupled with a sneer at the loud-praying Puritans. It occurs in the fourth act of that very powerful tragedy, when amongst other tortures inflicted on the unhappy duchess whose death has been determined upon, a "Masque of madmen" is introduced. One of them says: "Shall my 'pothecary outgo me because I am a cuckold? I have found out his roguery; he makes alum of his wife's urine, and sells it to Puritans that have sore throats with overstraining."

The allusions in the older writers to "casting the urine," uroscopy, as it is now the fashion to call it, and to the impudent rogueries of the quacks who flourished by it, are too numerous to be taken up on this occasion. In like manner I must pass by the amusing tricks and impostures of the quack-salvers and mountebanks who figure so constantly in the plays of the seventeenth century. I cannot resist, however, giving one example of the latter which I am sure you will enjoy. It is from the play of The Widow, by Ben Jonson and others, *circa* 1616, IV, 2. Latrocinio, the quack, happily named, is receiving his dupes and says:

> You with the rupture there, *hernia in scrotum*,
> Pray let me see you space this morning; walk, sir,
> I'll take your distance straight; 'twas F. O., yesterday;
> Ah, sirrah, here's a simple alteration!
> *Secundo gradu*, ye F. U. already;
> Here's a most happy change. Be of good comfort, sir;
> Your knees are come within three inches now
> Of one another; by to-morrow noon
> I'll make 'em kiss and jostle.

Here, too, are some therapeutic and hygienic maxims for summer. This extract is from Summer's Last Will and Testament, by Nash, 1593. Orion, ruler of the dog-days, says:

> While dog-days last the harvest safely thrives;
> The sun burns hot to finish up fruit's growth.
> There is no blood-letting to make men weak.
> Physicians in their Cataposia
> r. little Elinctoria
> Masticatorum and Cataplasmata;
> Their gargarisms, clysters and pitch'd cloths,

> Their perfumes, syrups, and their triacles
> Refrain to poison the sick patients,
> And dare not minister till I be out,
> Then none will bathe, and so are fewer drown'd.
> All lust is perilsome, therefore less us'd.

Cataposia used to mean boluses, but strictly is anything to be swallowed. Elinctoria were medicines to be licked up.

The dog has been credited with an instinctive knowledge of physic and surgery, and his tongue, with which he licks his own wounds, is popularly supposed to have powerful curative virtue. The following verse is from Flowers of Epigrammes, by Timothy Kendall, 1577:

> Fower properties praiseworthy sure,
>   are in the dog to note:
> He keepes the house, he feares the thefe
>   by barking with his throte.
> He plays well the Phisition,
>   with licking tongue he cures;
> Unto his master still he stickes,
>   and faithful fast endures.

In a play just quoted, Summer's Last Will and Testament, there is a longer account:

> That dogs physicians are, thus I infer,
> They are ne'er sick but they know their disease,
> And find out means to ease them of their grief;
> Special good surgeons to cure dangerous wounds,
> For stricken with a stake into the flesh
> This policy they use to get it out:
> They trail one of their feet upon the ground,
> And gnaw the flesh about where the wound is,
> Till it be clean drawn out; and then, because
> Ulcers and sores kept foul are hardly cured,
> They lick and purify [them] with their tongue,
> And well observe Hippocrates' old rule,
> The only medicine for the foot is rest;
> For if they have the least hurt in their feet,
> They bear them up and look they be not stirr'd.
> When humours rise they eat a sovereign herb,
> Whereby what clogs their stomach they cast up;
> And as some writers of experience tell,
> They were the first invented vomiting.

In a passage which has been read you will remember that the irascible Antonio tells his surgeon who has decided that it will require forty days to heal his patient's wounds:

> I have a dog shall lick me whole in twenty.

There is a story which Ricord delighted to tell as to his travels in Spain. He employed a farrier who also doctored horses, to attend to his team. The man refused any recompense on the ground that he would not accept a fee from a brother physician. In the Musarum Deliciæ, published in 1636, is this epigram:

> A FARRIER PHYSITIAN
>
> A neate Physitian for a Farrier sends,
> To dress his horses, promising amends:
> No (quoth the Farrier), amends is made.
> For nothing do we take of our own trade.

An example of the prevailing belief in sympathetic remedies is to be found in the use of fox's lungs as a restorative in certain disorders of the respiration. Reynard is famed for his speed and endurance and consequent long-windedness. His

odor seems to have been also thought efficacious. In The White Devil, by John Webster, 1612, IV, 2, is this:

> Thou hast stain'd the spotless honour of my house
> And frighten'd thence noble society ;
> Like those which sick o' th' palsy and retain
> Ill-scenting foxes 'bout them, are still shun'd
> By those of choicer nostrils.

Again in The Devil's Law-case, by the same writer, 1623, III. 3:

> This is the man that is your learned counsel,
> A fellow that will trowl it off with tongue.
> He never goes without restorative powder
> Of the lungs of fox in 's pocket, and Malaga raisins
> To make him long-winded.

Falstaff carried sugar candy for the same purpose.
In a play by Brome, The English Moor, 1659, I, 3, is this:

Melicent. Where be my bride-maids?
Testy. They wait in your chamber.
Buzzard. The devil a maid 's i' this but my fellow Madge the kitching maid, and Malkin the cat ; a batchelor but myself and an old fox that my master has kept a prentiship to palliate his palsie.

Epitaphs abound in medical allusions but are foreign to the present subject, but I am tempted to quote one because of its neat description of two consecutive amputations for gangrene. It is, I suppose, still to be seen in Banbury Churchyard in England, and tells of a young man "who died by a mortification which seized in his toe (his toe and leg both being cut off before he died)."

> Ah ! cruel Death, to make three meals of one,
> To taste, and eat, and eat till all was gone.
> But know, thou Tyrant, w^n th' last trump shall call,
> He 'll find his feet to stand, when thou shalt fall.

The lugubrious drawings of the Dance of Death, which were so popular about the period of the Renaissance, could be well illustrated by passages from the English poets. The skeleton, and especially the skull, offered many temptations for moralizing. In The Revenger's Tragedy, by Tourneur, 1608, Vindici takes up the skull of a former mistress of his prince and says with bitter irony:

> Here's an eye
> Able to tempt a great man—to serve God.
> A pretty laughing lip that has forgot how to dissemble.
> Methinks this mouth should make a swearer tremble,
> A drunkard clasp his teeth and not undo 'em
> To suffer wet damnation to run through 'em.

The term *grip*, which has become so familiar, was an old-time name for Death, expressive of the suddenness with which he seized his prey. Here is an example of its use from a poem by Barnabe Googe, 1563:

> So death our foe
>   consumeth all to nought ;
> Envying these
>   with dart doth us oppress ;
> And that which is
>   the greatest grief of all,
> The greedy Grip
>   doth no estate respect.
> But when he comes,
>   he makes them down to fall.

In Quentin Durward, Sir Walter Scott, who was deeply read in the old poets, makes Le Balafré observe, in explanation of the dying wish of the Boar of Ardennes whom the former had slain: "Men have queer fancies when old Small-back is gripping them."

I shall close this rather desultory paper with an extract from the author from whom I have just quoted, Barnabe Googe. It describes in a fanciful but impressive way the contest between "Death our foe," and the rich man who is sailing at his ease on the sea of pleasure. The latter is well delineated, and his devotion to sensual enjoyments forcibly portrayed. Then begins the catastrophe:

> But in the midst of all his mirth,
>   while he suspecteth least,
> His happy chance begins to change
>   and eke his fleeting feast.
> For Death (that old devouring wolf),
>   whom good men nothing fear,
> Comes sailing fast in galley black,
>   and, when he spies him near,
> Doth board him straight, and grapples fast,
>   and then begins the fight.
> In Riot leaps as captain chief,
>   and from the mainmast right
> He downward comes, and Surfeit then
>   assaileth by and by ;
> Then vile Diseases forward shoves
>   with pain and grief thereby.
> Life stands aloft and fighteth hard,
>   but Pleasure, all aghast,
> Doth leave his oar, and out he flies—
>   then Death approacheth fast,
> And gives the charge so sore that needs
>   must Life begin to fly,
> Then farewell all ; the wretched man
>   with carrion corse doth lye,
> Whom Death himself flings overboard
>   amid the seas of sin,
> The place where late he sweetly swam,
>   now lies he drowned in.

TETANY IN PREGNANCY.

By H. M. Thomas, M. D., *Assistant in Neurology.*

[*Read before the Johns Hopkins Hospital Medical Society, May 20, 1895.*]

The occurrence of tetany is so rare in this country that I thought it might not be without interest to some members of the Society to have their attention called to the history of a case which I believe to be an extremely good example of this disease. The fact that in this instance the disease stood in close relation to several pregnancies makes it somewhat more remarkable, for although the association is well recognized, it is by no means common.

The important points in the history of the case, which I had the opportunity of examining in the Johns Hopkins Hospital, are as follows:

Mrs. L. P., æt. 33. There was nothing in her family history of importance, and from her own account the patient seems to have been strong as a young girl. She may have had convulsions as an infant, but certainly not after her first year. There is no history of any sort of hysterical attacks. She was married at 18, and her first child was born nineteen months afterwards. She was well during this pregnancy. Her second child was born two years after the first. During the last two months of this pregnancy she began to suffer with stiffness and aching of her hands. Just before her confinement she was better, and continued so for nine days after; then the cramps returned, and she rarely passed a day without having several attacks, each lasting for a few minutes. As she expresses it, " her hands would close and at times her feet would draw." These attacks lasted until September, when she was free from them for two months, but after she was exposed to cold they came on again with great severity and were accompanied by intense pain. At one time the spasms in the muscles of her hands and arms did not relax for a week. She weaned the baby, and being exposed to cold at her second menstrual period, she had another very severe attack.

Directly after this her third pregnancy set in, and she became entirely free from cramps for five months, but was subject to them again during the next three months, and was again free from them during the last month. Shortly after labor she contracted pneumonia and was ill for three months.

Her fourth pregnancy began when the third child was three months old. She had no cramps until the middle of the fifth month, when they recurred as in the former pregnancies. She was much better just before labor, but during labor had a very severe attack for a few hours. On the ninth day after labor she had another attack, and then became free from them.

The fifth pregnancy began when the baby was five months old. Attacks of cramp came on as usual at five months and were somewhat more intense. The last month of pregnancy was free, but as before she had an attack on the ninth day after labor, and was then again free until she began to menstruate, nine months later. After this she had an attack with each period.

The sixth pregnancy set in in November, 1887, and was a repetition of the preceding pregnancies, except that the cramps were somewhat worse. She began to menstruate again in February, 1889, and the cramps returned and recurred around each period until warm weather in June, when she became entirely well and continued so until December, when she was again subject to them during the winter. She was free from them during the summer of 1890, and again affected during the winter. In the next summer, that of 1891, she was much better, but not absolutely without symptoms.

Her seventh pregnancy began in September, 1891. As in the former pregnancies she had no cramps during the first five months, although it was winter, but the attacks when they came on were extremely severe. She was free for six weeks before confinement, had no attack on the ninth day, and none until February, 1893, when she began to have slight intimations of them. Menstruation reappeared in May, and with it an attack of cramp. In June she had a severe attack, in July a very slight one, and was then free from them until winter. During December, January and February they were severe. She came to the Johns Hopkins Hospital in March, 1894, and while there had no attacks.

The description which the patient gives of these attacks is very graphic and characteristic. They begin with a tired, aching sensation in her hands, which is soon followed by the fingers becoming stiff and drawing shut, the feet also becoming stiff and drawn. In a severe attack the pain is intense, and the fingers are so tightly closed that the nails cut through the skin, the arms being stiff and held close to the chest and the hands blue and swollen. At times the spasm spreads to many other muscles; the whole body becomes stiff, and the face and eyes are drawn, and even the muscles of the larnyx are affected, stopping respiration for a moment or two and causing her to feel as if she were going to strangle. The patient has never lost consciousness in an attack.

The duration of the attack varies very greatly, from a few minutes to several hours, or even days, and she has never found anything that seemed to shorten them, although the pain can be controlled to a certain extent by repeated doses of morphia.

The examination of the patient on several different occasions yielded as the most important points the following:

She appeared to be a bright, intelligent woman, and had a wonderfully clear recollection of the history of her case. There was nothing about her that suggested hysteria. Her eyes were normal; there was no paralysis and when examination was apparently normal, and I was unable to demonstrate any hyperexcitability.

On several occasions fibrillary contractions were noticed in the muscles above the wrist, but we never saw an exacerbation of observing a spontaneous attack of spasm of the muscles.

We were always able to produce a sharp contraction of the facial muscles by tapping the nerve root or its several branches.

and, on one or two occasions, even stroking the skin over the nerve would produce the effect.

Continued steady pressure over any one of the nerves in the arms would cause a tonic spasm in the muscles supplied by it. This was much harder to demonstrate in her legs, and indeed we were only able to produce an incomplete spasm. Continued pressure on the facial nerve produced no spasm.

The nerves all responded to a much weaker faradic current than is the case in a normal individual.

There was a marked increase in the excitability of the nerves to the galvanic current, the K. Cl. C. occurring to such a small current that the galvanometer would only just indicate it. The anode opening, tetanus could be obtained in response to a weak current, usually between one and two M. A.

The most interesting electrical condition was discovered more or less by accident. It was noticed that when a comparatively strong current (two M. A.) was allowed to pass through a nerve, and when the stimulating pole was the cathode, the muscles were thrown into tetanus, which did not subside until the current was broken. The cathode was then placed over the nerve and the current was very gradually increased from nothing; when the current was still very weak, often indeed before the galvanometer indicated the passage of any current, one could notice fibrillary contractions in the muscles, and as the current was increased the contractions became more marked and the muscles began to be tetanized. This tetanus continued to increase until all the muscles supplied by the nerve were thrown into a strong, steady spasm, which passed off suddenly if the current was broken, or gradually, if it was gradually decreased. If the anode were substituted for the cathode, no such occurrence took place; on the contrary, several times when fibrillary contractions were already present they became much less marked as the current was increased. The current could be increased to five or even seven M. A. without causing tetanus.

This contraction, which, as far as I know, has been noticed but once before (by v. Bechterew, Neurol. Centralb., 1893, p. 755; Deutsch. Zeitsch. f. Nervenheil., vi, p. 457, 1895), is probably due to the production of cathelectrotonus in the nerve, and may be called cathelectrotonic tetanus (C. Elt. Te.). It could be demonstrated in all the nerves, and offered a most excellent opportunity for study of the muscular distribution of the different nerves.

There was but one exception to the general rule, and that was in the left ulnar nerve above the elbow, where the anode as well as the cathode produced the Elt. Te. There was also here, as would be expected, An. C. Te.

I did not demonstrate any increased sensory excitability to either current, but the tests were not made as carefully as they should have been.

We always found the deep reflexes exaggerated, but more so on some days than on others, and indeed the ease with which the objective symptoms could be brought out varied a good deal from day to day. Her menstrual period came on just before leaving the hospital, and the second night she had a slight attack of cramps in her hand; on the following day all the signs before noted were much exaggerated.

After going to her home in Virginia she suffered a good deal of pain. I last heard from her in the fall; at that time she had begun to have her usual premonitory symptoms, and felt sure that she was going to have a return of the spasms during the winter.

I think this case is an unusually good example of this disease, Tetany, and I may perhaps be permitted to bring some of the more important features to your especial attention.

The disease had lasted twelve years, and bore a most interesting relation to the six pregnancies through which she had passed during this time. She was always perfectly well during the first half of pregnancy, but had then daily attacks of tetany, which became more violent and alarming with each succeeding pregnancy. For three or four weeks before confinement she had no attacks, and only once during labor did she have the spasms, but on the ninth day after confinement she had always had a severe attack, except in the case of her last confinement. While nursing her babies she was free (with one exception, that of the second child), but when menstruation reappeared she was subject to tetany at each period during the cold weather, but was free from them during the summer. In April, 1894, when she was comparatively well, there was no difficulty in demonstrating Trousseau's symptom, the facial phenomenon, and a very great increase in the electrical excitability of the nerves.

·Trousseau and all subsequent writers have mentioned pregnancy as a predisposing cause of tetany, but in point of fact there have not been many cases reported in which the relation was noticed.

In 1887 Meinert of Dresden (Arch. für Gynäkologie, Vol. xxx, p. 444) published an article upon the subject, in which he abstracted all the cases he had been able to find in the literature. He collected in all nine cases, only four of which were at all typical, and in only one of the four was there an examination of the nervous system. This is Weiss's interesting case, which I shall have to refer to again. Meinert himself reports a good case, that of a woman who had attacks of tetany during two of her six pregnancies. Trousseau's symptom was demonstrated.

Hoffman (Deut. Arch. f. klin. Med., 1888) records a case in which there was tetany shortly after confinement, then attacks during cold weather, freedom for a year, then another attack after confinement, immunity for six years, until she again became pregnant, when the attacks reappeared. She had no more attacks after confinement until she contracted typhoid fever, when they returned, stopping on her recovery.

Herman (Lancet, April, 1890) reports a case of tetany in pregnancy, with nephritis and cancer of the pylorus. In this case the spasms occurred four days before labor. They had been preceded by continued vomiting. The attacks stopped after confinement. Trousseau's symptom could not be produced. Facial phenomenon and elec. excitability were not tested for. Death occurred from cancer of the stomach several weeks after confinement.

Dakin (Trans. Obs. Soc. of London, 1891), under the title "Tetany in Pregnancy," records a case of a woman who in the fourth month of pregnancy began to vomit incessantly and then had continuous spasms in the muscles of her hands

and arms, and finally in those of her face. She died on the third day. No objective examination was made. He refers to Meinert's and Herman's articles and tabulates the cases.

Frankl Hochwart, in his monograph "Die Tetanie" (Berlin, 1891), says that he was able to find the report of fifteen cases of tetany which occurred during pregnancy. He gives no abstracts.

Julius Neumann, in March, 1894, read before the Obstetric and Gynæcological Society of Vienna a paper on the occurrence of tetany during pregnancy, a preliminary abstract of which is published in the Centralblt. f. Gynäk. 1894, p. 489. The paper has just appeared in the Arch. f. Gynäk., Vol. xlviii, 1895. He gave the history of two cases. The first was that of a woman who had been pregnant eleven times. The first four pregnancies were normal. In the fifth pregnancy, and in all subsequent pregnancies, except in two in which there was a miscarriage at the third month, she had attacks of tetany, from the time of the first fœtal movement until delivery. She was observed in the last pregnancy, and it was then noticed that the uterine contractions occurred synchronously with the cramps in the extremities. After confinement the attacks became much less severe and disappeared in the second week. Trousseau's symptom and the facial phenomenon were demonstrated.

The second case was that of a woman who had been pregnant seven times. She had attacks of cramps in the last part of her first pregnancy, and when she was nursing her third child, but had no more cramps until the seventh pregnancy, in which she was observed. For two months before entering the hospital she had had light cramps in her hands, which had become very intense at the onset of labor, and on admission the spasm was so severe that she was entirely helpless. The cramps became very much better after delivery, but recurred with great intensity when the uterus was emptied of some retained clots. The attacks were frequent while the patient was nursing her child, but ceased entirely when she weaned the child at six weeks. Trousseau's symptom, the facial phenomenon and increased electrical excitability of the nerve were observed. Neumann saw the patient eight months later when she was again four months pregnant. At that time the facial phenomenon was easily produced and Trousseau's symptom was present.

Richard Brown (Centralbl. f. Gynäk. 1894), at the same meeting, reported two cases, in the first of which cramps came on during confinement, and here too they occurred with each labor pain, and stopped when the woman was delivered. The second case was associated with osteomalacia and persisted after confinement.

Gottstein's case, which I shall refer to later, completes the list. All the writers have been struck with the rarity of the occurrence, but there can be no doubt that at times pregnancy does predispose to tetany, and it is interesting to notice that the attacks occur almost always in the last half of pregnancy; indeed, during the first three or four months there seems usually to be some condition unfavorable to the occurrence of such attacks, for in certain cases which are subject to tetany they completely disappear with the onset of pregnancy, to reappear at the fourth or fifth month. What circumstance it

is in connection with pregnancy that predisposes to tetany we are entirely unable to say, for we have as yet not much light on the whole subject of the causation of this remarkable disease. Certain facts have been determined, however, which seem to point out the direction which we must follow in the investigation. Quite a number of cases of tetany have been recorded in connection with disturbances of the stomach and intestines, and certain observers have isolated toxic substances from the urine in these cases, and they believe that it is the action of these poisonous substances upon the nervous system, more particularly upon the spinal cord, that produces the disease.

In those cases of tetany which occur in epidemics, and those cases which sometimes follow the ordinary acute infectious diseases, the thought naturally occurs that the condition is brought about by the action of the soluble toxic agents produced by the different specific micro-organisms, for the study of multiple neuritis has taught us how sensitive the nervous system may be to such substances.

Certain poisons, such as chloroform and alcohol, may produce tetany, and finally the occurrence of typical tetany after the total extirpation of the thyroid gland is of the very greatest importance. This condition follows the operation in about 22½ per cent. of the cases, i. e. in Billroth's clinic 12 times in 53 cases (v. Eiselsberg). That this is due in some way to the loss of the gland itself is shown by the fact that not a single case occurred after 115 operations in which only part of the gland was removed, and also by experimental work on animals. The function of the thyroid gland is just now one of the most interesting problems in physiology, and although there is much to be determined, it has been demonstrated that it plays an important rôle in the metabolism of the body. It is believed to do this either by changing harmful substances into harmless ones, or by secreting some substance that is important for the economy. Perhaps it acts in both of these ways. At any rate it seems that when the function of the thyroid gland is abolished, either by disease or by operation, the blood is changed in such a way that it tends to act injuriously upon the nervous system. Therefore we are to look for the cause of tetany following the extirpation of the thyroid gland as depending essentially upon the same kind of condition as that which we saw was the probable cause of tetany occurring under the other circumstances mentioned, i. e. the action of some poisonous substance on the central nervous system.

The only other predisposing causes of tetany which Frankl Hochwart gives are in connection with child-bearing, i. e. pregnancy, labor and lactation. Does it not seem probable that under these conditions we may have such an altered state of metabolism that at times there may be present in the circulation substances which tend to act injuriously on the central nervous system and cause, among other nervous disturbances, tetany?

The circumstances which combine to cause tetany during pregnancy must be extremely rare; the fact that there are not more than twenty cases recorded sufficiently proves this.

In looking for a positive explanation, a case long seemed interesting in this connection. Several years ago Dr. Wm. S.

Halsted did a great deal of experimental work on the thyroid glands of dogs. The work has not yet been published, but Dr. Halsted has kindly given me permission to refer to certain experiments which bear particularly upon the subject under consideration.

He found that dogs always died with symptoms of tetany when both thyroid glands were removed, but that he could keep them alive for an indefinite time without symptoms, and with only a very small fraction of the original gland tissue present, if he took away the gland piecemeal in several operations.

Two of his dogs which were undergoing this procedure, and were apparently in perfect health, became pregnant. The first dog had lost the left thyroid gland four months previously. For two days before she gave birth to her pups she had convulsions, and behaved just as did the dogs whose thyroids had been completely extirpated. She had no more convulsions after the pups were born, and bore without symptoms two other operations, reducing the gland tissue to one-fourth of the right thyroid. She finally died with symptoms of tetany after what was left of the thyroid had been removed.

The left thyroid of the second dog had been removed in two operations, and one-third of the right three months before she became pregnant. The day before the pups were born she had tremor of the tongue and general clonic and tonic convulsions, that is, she showed the symptoms which follow total extirpation of the glands. She was perfectly well the next day, and remained so even after Dr. Halsted by subsequent operations had reduced her to only one-ninth of the right gland. She died with symptoms of tetany when this last bit was removed.

These experiments seem to show that the mutilated thyroids in these dogs were, as far as could be determined, quite sufficient for all ordinary circumstances, but that pregnancy, or to speak more accurately, labor, introduced conditions which required additional work from them, which they were unable to perform.

May there not have been in the cases which have been observed in women some abnormality of the thyroid gland, and may it not have been the combination of this condition with that of pregnancy which led to the production of tetany? A few of the cases lend a certain amount of support to this view.

In Weiss's case a goitre was removed entire from a woman four months pregnant; immediately after the operation the spasms of tetany came on; she was one of the four cases in Billroth's clinic of operative tetany that did not end fatally but passed into the chronic stage.

In Neumann's first case there was a goitre which had been present since the time of her first confinement, and he thinks that this may have had something to do with the production of the disease.

Gottstein's most interesting case, which has just been reported in the Deutsche Zeitschrift für Nervenheilkunde, March 15th, 1895, is important in this connection. A woman of 34 years who had had attacks of tetany in her right side since she was twelve years old, became very much better before her marriage, having gone without any attacks for more than a year. She married at 28, became pregnant in five months, and at the fourth month began to have severe attacks of tetany, which increased in severity until she was confined, when they completely stopped. They reappeared in eight weeks. Two years afterwards she had an abortion, during which she had a very severe attack. She was then better for a time, but the attacks returned and were present every day until she was seen in 1892. Upon examination she showed the typical symptoms of tetany, and as the most careful examination was unable to reveal an evidence of the presence of the thyroid gland, the diagnosis was made of tetany due to atrophy of the gland.

Mikulicz made two attempts to transplant the thyroid gland of another patient into her abdominal wall. The glands were absorbed, and it was noticed that during the process the patient was very much better, but afterwards returned to her previous condition. In March, 1894, they began to treat her with thyroid extract, and a very marked improvement was at once noticed. Her attacks were reduced from 20 to 30 during a night to 5 or 6, and she was in every other way much better. Certainly a most remarkable result.

I am fully aware that the facts are few, and may perhaps be better explained in some other way, but they seem to me to be best brought into accord with our present knowledge, by the hypothesis that the occurrence of tetany during pregnancy depends primarily upon some abnormality in the function of the thyroid gland, and that it is the unusual demands made upon this organ in the later months of pregnancy which make this such a favorable time for the occurrence of the attacks.

I am inclined to entertain the opinion that it is probable that tetany occurring under other conditions will in most cases be found to be due to an insufficiency, absolute or relative, in the action of the thyroid gland or like structures. If this be true it may serve to explain why the disease occurs so frequently in certain localities and is so rare in other places.

A DEATH FROM CHLOROFORM. IMPOSSIBILITY OF INDUCING ARTIFICIAL RESPIRATION ON ACCOUNT OF RIGID THORAX AND ADHERENT ABDOMINAL VISCERA.

By J. G. Clark, M. D., *Resident Gynecologist.*

The case which I report is of especial interest, as all of the conditions required for the proper administration of chloroform were fulfilled, and when the first danger-signal was observed, the anæsthetic was withdrawn and the most energetic and prolonged resuscitation measures were employed without the slightest reaction either in the cardiac or respiratory functions.

In the discussion of Dr. Hare's paper before this Society,* Dr. Kelly, in describing his method of resuscitation, laid especial stress upon the fact that in patients with contracted and fusiform chests or with pigeon-breasted chests, or in aged women, this method would probably be of no avail in establishing respiratory movements.

This case fully supports his statement as demonstrated clinically and by the autopsy, although at the time of Dr. Kelly's report no case of chloroform asphyxia had come under his observation which had failed to react when this method was employed.

The patient was admitted twice to the gynecological wards, first, April 18, 1894, when she was operated upon for a multilocular ovarian cyst, and again, January 1, 1895, when she returned on account of a stitch-hole sinus and persistent vesical irritability.

Her history, as given at the time of her first admission, is as follows:

B. B., colored, aged 47 years, married.

Present Complaint.—Swelling of abdomen and pain in right leg.

Marital History.—Married 27 years; 1 child, born about 26 years ago, died when 18 months of age. Labor normal. No miscarriages.

Menstruation began at 14 years, flow moderate, lasting three to four days, regular, not painful. For last year irregular. Symptoms are those of approaching climacteric.

Family History.—Negative.

Personal History.—Since childhood patient has been strong and healthy up to present illness. Has done much hard manual work.

Present Illness.—One year ago the patient noticed a slight enlargement of her abdomen, but as it was not accompanied by pain or discomfort, she gave it but little thought. The swelling increased slowly but steadily until February, 1894, when it was quite marked. At this time the right leg began to swell; four weeks later the left leg also became œdematous. At present both legs are greatly swollen from the toes up to Poupart's ligaments, and deep indentations can be made with the finger-tips. She complains of slight dyspnœa when lying in the recumbent posture.

General Condition.—A rather emaciated woman of about 45 years, skin brown, mucous membrane somewhat pale,

arcus senilis well marked, small cataract of right eye. Arteries hard and appear to be atheromatous. Abdomen greatly distended by a fluctuant tumor, smooth in outline and presenting a small boss on the left side. Tumor somewhat larger on right than on left side. Appetite poor, tongue pale and flabby. Bowels constipated. Pain just before and after urination. Walking not painful, but difficult, on account of general weakness. Complains of palpitation of heart and general debility. Within the last year she has lost many pounds in weight.

Examination of Chest.—Thorax long, contracted at waist, sternum prominent, pigeon-breasted. Costal respiratory movements limited. Heart and lungs normal.

Examination of Abdomen.—Abdomen greatly distended, particularly on whole of right side, veins prominent, skin of natural hue, linea albicantes well marked. Greatest circumference of abdomen below umbilicus 96 cm.

Percussion shows a tympanitic area extending from ensiform cartilage to 3 cm. above umbilicus, laterally to nipple lines. Below umbilicus, percussion note flat. Wave of fluctuation distinct over dull area. Whole of lower abdomen from the above named tympanitic area to pubes is filled with a cystic mass; in left lower zone a nodular mass can be easily mapped out.

Per Vaginam.—Outlet relaxed, left vault of vagina filled with a fluctuant immovable mass directly continuous with mass in abdomen. Left vaginal vault along with cervix drawn up into pelvis and not palpable.

Diagnosis: Cystoma ovarii multilocularis.

Treatment.—Cystectomy.

Operation : 4, 23, 1894. Patient was nervous and very much frightened at the thought of taking ether, consequently chloroform was first administered until the secondary stage of anæsthesia was entered, when ether was substituted. When placed upon the operating table her pulse was 120 and regular. No change in the pulse or respiration was noted in changing from chloroform to ether.

Incision 17 cm. long through thin abdominal wall, cystic mass exposed, densely adherent to abdominal parietes.

Peritoneum not recognized on account of its intimate adhesion to tumor. Cyst evacuated with trocar of 6 litres of dark brownish fluid. Many daughter cysts evacuated by rupturing their walls with the fingers. Enucleation of cyst wall from its bed of adhesions excessively difficult on account of its intimate adhesions to abdominal walls and intestines. Hemorrhage very free. Cyst seemed to spring from right side, but tubes and ovaries were so incorporated with it by dense adhesions as to render its differentiation impossible.

The ovarian and uterine arteries were tied to check hemorrhage, and the mass with the uterus was removed. In enucleating the cyst wall from the floor of the pelvis, a part of its wall was left behind. A longitudinal tear 3 cm. in

length in the rectum occurred during the enucleation; this was immediately sutured with five silk ligatures.

Peritoneal cavity washed out with salt solution, and five pieces of gauze introduced to check the extensive oozing over the adherent areas. The operation was extremely difficult, attended with profuse hemorrhage, and required one hour and forty-five minutes to complete it. Notwithstanding these adverse conditions the patient was removed from the table with a pulse of 128, only an increase of eight beats over that noted before the anæsthesia was begun. The progress of the anæsthesia was even and quiet, and at no time caused the slightest alarm.

Seven days from the time of operation the great œdema noted on her admission had entirely disappeared. The patient made a good recovery, and was discharged eight weeks from the date of operation with the following note: Abdomen soft, no tenderness, incision perfectly healed, general condition good.

It is the custom in the gynecological department, in all cases where patients are nauseated by ether, or have a strong aversion to it on account of the disagreeable sensations produced in its earlier administration, or where the arteries are sclerotic, to administer chloroform in beginning the anæsthesia, and this is often continued throughout the operation, depending upon the preference of the anæsthetizer. The employment of chloroform was doubly indicated in this case, as the arteries were sclerotic and the patient had a marked antipathy for ether.

The above detailed history of the patient's condition, her operation, and the progress of the anæsthesia, is of especial value, as it furnishes a standard for comparison with the notes made on her case previous to her second anæsthetization, eight months later, during which she died. The case is also of interest from the pathological aspect, as the small portion of cyst wall left adherent to the rectum at the time of her operation proliferated rapidly and formed the large multilocular cyst noted in the autopsy report.

The next note on the case was made Jan. 2, 1895, at the time of the patient's readmission to the hospital eight months after her operation, as follows: Patient returns to-day complaining of considerable pain at a point on the anterior abdominal wall 4 cm. to the left of the umbilicus, probably from its situation the seat of one of the sutures. This has been discharging for the last six months. The pain is not at all severe, the principal annoyance being the discharge, which up to a few days ago has been quite profuse. She also complains of great vesical distress, which has been especially marked for the last three weeks, often causing her to urinate as often as every half-hour. General condition about the same as noted in the first history. No œdema of extremities, tongue clean and of a good color, pulse full and regular, arteries sclerotic. Patient thinks she has lost weight since her operation.

Physical examination: Abdomen large and flabby, incision of former operation completely healed. A small sinus 4 cm. to left of umbilicus admits probe 1 cm.

Vaginal examination shows an immovable ovoid mass behind and above symphysis which does not diminish in size on catheterizing the bladder.

On account of the pain caused by the examination and the ill-defined nature of the tumor, it was deemed best by Dr. Kelly to administer an anæsthetic. Chloroform was again chosen for the same reasons as those noted at the time of her operation.

The first stage of anæsthesia was quiet and passed without any perceptible change either in the pulse or respiration; following this the patient became rigid, and as this condition was very persistent, the anæsthetizer very properly brought the Esmarch inhaler closer, but at no time was it nearer than two inches from the face. The patient still remained rigid, and as her respirations began to grow quite shallow it was considered best by the anæsthetizer to change to ether. He turned from the patient long enough to get the ether cone which was at his side, and on turning back he was unable to find the temporal pulse, and at once felt for the radial pulse, which was also imperceptible. Respiration by this time had also ceased. No time was lost in proceeding at once to artificial resuscitation. Dr. Stokes quickly got upon the table and lifted the patient by the knees until she rested on her shoulders, another assistant extended the head by pulling and lifting forward on the condyles of the lower jaw, while Dr. Kelly instituted respiratory movements by placing the open hands on each side of the chest posteriorly over the lower ribs and drawing the chest well forward and outwards, holding it thus for about two seconds, and then reversing the movement by replacing the hands on the front of the chest over the lower ribs and pushing backwards and inwards, at the same time compressing the chest. The success of this manœuvre is demonstrated by an audible rush of air in and out of the chest, but in this case there was not the slightest respiratory effect produced, and after a thorough test it was abandoned. During this time a nurse administered hypodermics of strychnine and atropine. Dr. Kelly has pointed out this class of cases as the ones which do not respond to this method.

He says: "In women with contracted, fusiform chests (tight lacers) this procedure is not available; respiratory movements should be induced in these cases by direct antero-posterior compression of the chest by placing one hand on the lower third of the sternum and the other on the back opposite the first and alternately squeezing the chest and relaxing the pressure." For this reason the antero-posterior compression was quickly resorted to as soon as the first method proved ineffectual. Notwithstanding the most energetic efforts, there was not the slightest effect produced, and at no time after the pulse first disappeared was it again felt. The failure of pulse and respiration occurred coincidently, although the respiratory function was apparently impaired first. Taking in connection with this clinical observation the fact that the heart, as shown by autopsy, was practically normal while the respiratory apparatus was greatly impaired, it appears certain that this was a case in which the failure in the respiratory function was the primary cause of death.

In the light of the autopsy it appears that no method would have been of value in this case, as in addition to a rigid pigeon-breasted thorax and an adherent left lung, the abdominal viscera were completely matted together and adherent to the anterior abdominal wall and the diaphragm, thus practically

immobilizing or splinting the diaphragm and rendering its movements and also the abdominal walls impossible by any artificial means.

The autopsy was made by Dr. Flexner, and I append the notes from the protocol.

Anatomical Diagnosis.—Lymphatic leukaemia, old operation wound; multilocular cyst of ovary (chloroform death); hydronephrosis and chronic diffuse nephritis; gall stones.

Body 160 cm. long, well developed, mucous membranes pale. Pupils dilated and equal. Abdominal scar 10 cm. from former operation, beginning 5 cm. below umbilicus and extending to 4 cm. of pubes. To the left of the umbilicus is a bloody scab, on the removal of which a small opening is seen in the skin. Probe, however, only passes through the skin.

On cutting through the abdominal walls, the viscera are found to be firmly adherent to parietal peritoneum, so that the abdominal organs, especially the bladder, are separated with great difficulty.

The large and small intestines, omentum, and stomach are matted together by firm adhesions, which, however, can be more easily separated than those binding organs to abdominal walls. Liver is very firmly adherent to diaphragm. On separating the loops of small intestine from each other, in the hypogastric region a large cyst of a greenish brown color with exceedingly tense walls is seen. The mass is slightly lobulated, there being three large ones, the right one appearing to be made up of a number of smaller ones. The peritoneum covering the mass was united to the surrounding loops of intestines by adhesions. The tumor was firmly adherent to the bladder in front and the rectum behind.

The right ureter is seen lying on the posterior abdominal wall and is very much dilated; lower down it becomes lost in the adhesions between the tumor and rectum. The tumor completely fills the pelvic cavity, the walls of which are so adherent that the fingers cannot be passed around it without first breaking up the adhesions. The lower half of the appendix vermiformis is adherent to the tumor.

Lungs.—Lungs voluminous and do not collapse on removal of sternum. Left lung is free from adhesions, but the pleural cavity contains about 50 cc. of yellowish serum.

The right lung is bound to the parietal pleura throughout its entire extent by firm adhesions, which are not readily broken down.

Spleen.—Weight 480 grams; measurements 17x12x5 cm. On section spleen presents a mottled appearance, consisting of numerous pearly white, almost opaque nodules varying in size from a millet seed to a hemp seed which are scattered through the pulp.

Heart.—Weight 340 grams; left ventricle wall 2 cm., right ventricle wall 5 cm. in thickness. Right and left side of heart contain fluid blood. Aortic and pulmonary valves normal. Tricuspid valves normal. Mitral valves very slightly thickened, otherwise normal. Consistence of heart muscle normal. Walls of coronary artery contain patches of fatty degeneration of the intima, more marked about the orifices of the branches. No embolus or thrombus; vessel clear of obstruction.

Liver.—Capsule covered with remains of adhesions, but not especially thickened. On section liver substance is found to be homogeneous and cloudy, of firm consistence and reddish color.

Gall-bladder contains ten dark black faceted stones. Common bile duct is patent.

Right Kidney.—Weight 110 grams, size 10.5x5x2.25 cm., very firm, excessively pale. Capsules strip off readily, but in some areas are firmly adherent and bring away masses of the cortex when removed. Pelvis and calices much dilated, as is also the right ureter. Cortex greyish white, except in small spots on the surface where there are a few irregular congested areas.

Left Kidney.—Weight 200 grams, 12x65x45, normal.

Pancreas normal.

Bladder greatly distended and adherent, otherwise normal.

Aorta: numerous patches of fatty degeneration throughout its whole extent, and especially marked about its orifices.

Trachea free, mucous membrane slightly congested.

Oesophagus and larynx normal.

A QUICK METHOD OF FILTERING BLOOD SERUM.

BY GIVEN CAMPBELL, M. D., AND A. D. GHISELIN, M. D.

Serum-therapy is now well established as a means of treating disease, and while writers may differ as to the amount that can be accomplished by its use, all agree that we have in it a most useful means of combating infectious diseases.

One of the arguments urged against its use is that in injecting the blood serum of an animal into a human being there is danger of communicating to the patient any disease, such as glanders, from which the animal may be suffering. Again, the serum cannot be sterilized by heat, and to prevent putrefactive bacteria from entering it, the strictest antiseptic precautions must be observed while the serum is being collected.

In view of these facts the writers desire to present to the Society a method of preparing blood serum which has been used successfully in my private laboratory for over a year.

All of the authorities on bacteriology agree that blood serum cannot be practically sterilized by filtration; the chief reason given being that albuminous liquids will not pass through a Chamberland bougie, or that if they do finally filter it will be found that in doing so their composition is changed, only part of the albumen of the liquid passing through, so that serum thus filtered will not .

Another objection urged is the difficulty experienced in preventing recontamination of the filtered liquid when the filtration is done by negative pressure, as is usually the case.

The reason for this is obvious. When filtration is accomplished by negative pressure a vacuum is formed in the flask for collecting the filtrate, and also, of course, in the interior of the bougie and in the connecting tubing: the unopposed pressure of the atmosphere (15 pounds to the inch) is the force which drives the liquid through the bougie.

Now the tendency of the air is to get in to fill this vacuum, and if there is the slightest break in any of the connections air will leak through to where the filtrate is and will carry bacteria with it.

The first of the objections, namely, that the serum is altered, is answered by the fact that while serum filters with difficulty and is altered in its composition when a low pressure is used to force it through the bougie, it filters very rapidly and passes through unaltered when, as in this method, a pressure of over 150 pounds is used in its filtration.

As to the second objection, it need only be said that in the present method a positive, not a negative pressure is used, and in place of the air being sucked into the filtrate, the tendency is rather to force air out through any faulty connection, because some air of course must be displaced when the filtrate enters the collecting flask.

The method here described was first thought of in August, 1893. Before going farther it may be said that no originality is claimed for this idea. The device is merely the expansion of an idea furnished by a very similar apparatus that appeared in the Army Exhibit at the World's Fair in Chicago. But the difference in price and practicability is much in favor of the modification. The apparatus just mentioned was for filtering liquids through a Chamberland bougie in which the pressure was obtained by the use of carbon dioxide gas. As to whether this apparatus had ever been employed for filtering blood serum the writers cannot say, but no report of the apparatus nor of its being so used can be found.

The very considerable expense of the apparatus just mentioned led the writers to devise a filter which answers every purpose and which can be readily procured and for a very moderate price.

A brief description of the device will be given here, and the exact measurements of the one in use by the writers will be given in a woodcut.

The filter proper is on the principle of a single-bougie water-filter, sufficiently strengthened to allow the safe use of a high pressure, and so arranged that a sterile flask may be attached to the bougie in such a manner that the filtrate undergoes no risk of contamination.

To the filter is connected a drum filled with liquefied carbon dioxide such as is used in charging soda water, and can be obtained of any dealer in soda water supplies. The drum most suitable for this purpose is sold by the Saint Louis Carbonic Acid Gas Company, of St. Louis.* It consists of an iron cylinder four feet long by four inches in diameter and contains ten pounds of the liquefied gas.

In the upper end of this cylinder is fixed a safety valve and also a valve by which the pressure can be turned on. To this

* Similar drums containing carbon dioxide under pressure are supplied by other manufacturers in several large cities.

valve is attached a very thick-walled rubber hose which has fixed in it a pressure gauge registering three hundred pounds. The hose with gauge and suitable connections for connecting the drum to the filter is furnished with the drum.

The method of using the filter is as follows: A rubber-stoppered flask having two tubes passing through the stopper is the vessel used for collecting the filtrate. One tube is short and has its upper end enlarged and loosely packed with cotton. To the outer end of the long tube is attached a piece of the best black all-rubber hose about two feet long, divided in the middle and the two pieces joined by a glass nozzle. On this piece of hose are two of Mohr's pinchcocks.
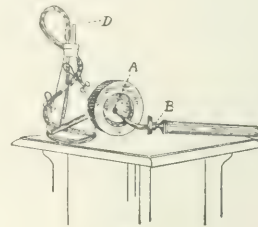
Fig. I.
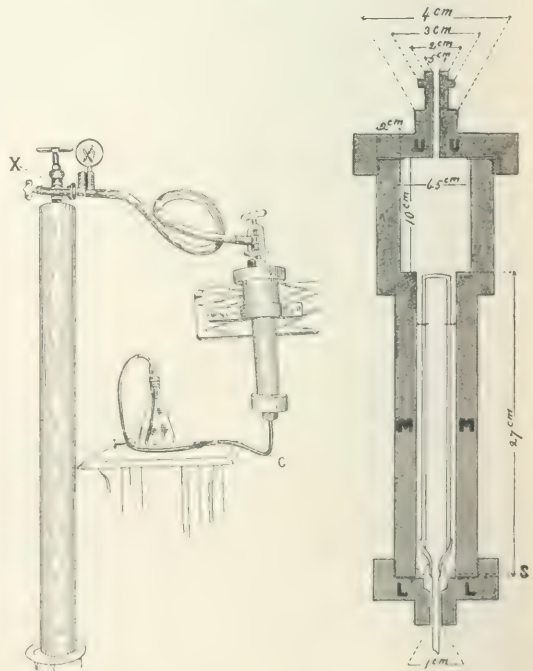
Fig. II.

Fig. III.

The other end of this hose is passed through the hole in the lower cap and gasket (A, Fig. I), and then through one of the rubber stoppers that are used to fix a bougie into a Pasteur

water filter. The hose is then slipped over the open end of the bougie, and the stopper just mentioned is slipped up along the hose and over the end of the bougie, with the hose of course intervening (*B*, Fig. I).

The apparatus thus connected as shown in Fig. I is now put into the steam sterilizer and sterilized for three quarters of an hour.

It is then removed and the bougie introduced into the shell (*M*, Fig. III), its stopper (*S*, Fig. III) carefully adjusted and the lower cap (*L*, Fig. III) screwed tight. Serum is now poured in the upper opening of the shell, and the upper cap (*U*, Fig. III) screwed on.

This serum is collected in the ordinary way except that mere culinary cleanliness, if this term be allowed, is used in place of the aseptic precautions that are so tedious and unsatisfactory in the old method.

The drum is now connected to the filter as seen in Fig. II. The valve (*X*, Fig. II) is now very gradually turned and the gauge observed, when it will be found to indicate an increasing pressure. When the pressure rises to the desired degree the valve is closed. The best pressure for filtering blood serum is 200 lbs., but much over this should not be used for fear of crushing the bougie.

When filtration is complete the drum is disconnected, the pinchcocks are closed on the rubber tube, one at each end of the glass nozzle (as shown in Fig. I), and the tube is cut off (at *O*, Fig. II). The cut extremity is enveloped in sterile cotton. The collecting flask may now be sealed (at *D*, Fig. I) and the serum preserved indefinitely. When it is desired to withdraw any of the serum for use the following precautions are employed: The sealed tube *D* is opened, leaving the cotton in place, and the end of the rubber tube which has remained over the lower end of the glass nozzle is slipped off. The hose being still full of serum acts as a syphon, so that when the pinchcock is opened the serum readily flows from the flask. By syphoning from the middle of the filtrate, any deposit of cholesterin that may have formed will be avoided. In filling test tubes in this way contamination is practically unknown.

Serum thus prepared is perfectly clear, coagulates at exactly the same temperature as unfiltered serum, nor does such filtration have any appreciable effect on any toxin or antitoxin that may be present.

To give an idea of the advantage of this method it need only be said that 1000 cc. of such serum can be filtered in five minutes.

The writers desire to express their thanks to Dr. H. H. Born of St. Louis for the very excellent photographs that illustrate the paper.

ST. LOUIS, MO.

PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS HOSPITAL MEDICAL SOCIETY.

Meeting of March 15, 1895.

Dr. ABEL in the Chair.

A Case of Pharyngomycosis Leptothrica.—DR. BARKER.

I wish to bring before you this evening a specimen of a rather rare pharyngeal disease, namely pharyngomycosis leptothrica, sections of which are exhibited under the microscopes. The piece of tissue from which these microscopical sections were prepared was sent me by Dr. Campbell of Chicago, who made a provisional diagnosis from the clinical appearances of the case.

This affection was first described by A. Fraenkel in 1878. He had noticed in the throats of a number of persons a membrane looking somewhat like that of diphtheria, but which produced no symptoms in the patient. He observed that the portions of the pharynx most likely to be attacked were the lateral walls, although sometimes the posterior wall and sometimes the tonsils and root of the tongue were affected. The clinical symptoms consisted solely, as a rule, of rawness or dryness with a sensation of tickling. The patient often discovered the disease himself by looking into his throat. In some cases there were manifestations of hypochondriasis and hysteria, and the attendant worry over the condition had impaired the general health of such persons. Indeed, owing to the emaciation which resulted from the anxiety of the patient, one case was taken to be tuberculous pharyngitis. The study of Fraenkel showed this disease to be due to the leptothrix buccalis which is present in the membrane in very large numbers. Many attempts have been made to cultivate the leptothrix, and some experimenters have stated that they have been successful. The disease has, however, not been reproduced by inoculation.

The diagnosis, even without the microscopical examination, is tolerably simple when one has once seen a case. The disease is most likely to be confused with lacunar tonsillitis; but this latter affection sets in acutely with a febrile paroxysm; and, moreover, the membrane does not resemble that of pharyngomycosis. It can also be readily distinguished from diphtheria both by the appearance of the membrane and by its clinical course. In pharyngomycosis there is no marked inflammatory reaction about the membrane, and when inflammation does occur it is supposed to be due to complications. When the disease attacks the tonsils the membrane may be mistaken for those tonsillar plugs so often seen clinically, but it can be differentiated from the latter by the difficulty or impossibility of removing the leptothrix membrane. Only a superficial examination could lead one to mistake thrush for this disease.

The treatment is not very satisfactory: the condition often persists for a long time; the prognosis is, however, good. All thus far agree that repeated cauterization is the best treatment.

Under the microscope what one finds is the following: The leptothrix occurs sometimes in quite long threads, the threads being composed of individual members which stain unequally. The leptothrix is formed in the crypts and on the surface of the tonsil, and seems to cause an increase of the superficial

epithelium. It is stated that it may invade the tonsil itself. In the specimen which I have examined I have not been able to make out the leptothrix in the substance of the tonsil. Looking into the crypt in a section through the middle of the plug one sees a central core made up of squamous epithelial cells; and going off at right angles from the sides of this core are the bundles of leptothrix threads. One of the best ways to demonstrate the organism in sections is to treat the latter with Lugol's solution for three or four minutes, washing out the excess with water and finally mounting the specimen in glycerine. One can then easily pick out the bluish-black leptothrix masses owing to the starch reaction. On the surface the leptothrix is mixed with loose epithelial cells. There is an increase in the number of lymphoid cells on the surface and in the crypts of the tonsils. But as the tonsil is always throwing out such cells, this is to be regarded as only an increase in the normal process of lymph-cell transudation on the part of the tonsil.

A Case of Anthrax in a Human Being.—Dr. Flexner.

Dr. Flexner.—I shall say a few words only regarding this case and then ask you to look at the specimens which have been placed under the microscopes for your inspection, as it is to be reported in full very soon by Drs. Bloomer and Young.

This case presents the usual features of that form of anthrax infections in human beings known as malignant anthrax œdemas. The œdema was of that peculiar gelatinous type often seen in some of the experimental infections in animals. It extended beneath the clavicles and affected the mediastinal tissues. This fluid contained large numbers of the anthrax bacilli. The bacilli were cultivated from the heart's blood and organs, thus denoting an anthrax septicæmia. Interesting localizations of the bacilli were found (1) in the stomach and intestines, producing areas of focal inflammation associated with necrosis and hemorrhage in which myriads of bacilli were contained; (2) in the peritoneum, causing an acute fibrino-purulent peritonitis, and (3) in vegetations upon the heart valves, producing an acute vegetative endocarditis.

NOTES ON NEW BOOKS.

Personal Reminiscences and Recollections of Forty-six Years' Membership in the Medical Society of the District of Columbia. By Samuel C. Busey, M. D., LL. D. (*Washington, D. C.*, 1895.)

This review of Dr. Busey's book was handed me by a friend who has greatly enjoyed and discussed my copy with me. It gives me pleasure to publish it with expressions of approval. One of the greatest needs in America to-day is the publication of many memoirs of this kind to furnish materials for the future medical historian.

I wish I could get one of my friends in Louisville, Kentucky, to do a similar work for that city, so rich in medical traditions.
                                                    H. A. Kelly.

In *Personal Reminiscences*, Dr. S. C. Busey, President of the Washington Medical Society, has written an entertaining and valuable book. The recollections cover a membership of forty-six years in the Medical Society of the District of Columbia, years that have transformed Washington from a country village with but two paved streets into one of the most beautiful cities in the world.

The description of old Washington, and of a young doctor's scramble to get on in it, in the early fifties, is realistic. The regular fee was one dollar a visit, often paid fractionally, or not at all, and the means of livelihood for the unmarried young physician were still further limited by the unwritten code of ethics behind which the family doctor of those days was intrenched. The young man might prescribe for the fathers and the children, if he could get a chance, but the mothers and grown daughters preferred to be blooded, or to take their calomel and senna, at safer hands. A bit of history in this connection is the fact that the use of prescription blanks was an outgrowth of the Civil War, and probably arose from some enterprising druggist who furnished the blanks free in order to advertise his wares.

The Civil War made such an immense change in medical practice, and Washington was for four years such a great receiving hospital, that it is surprising to find Dr. Busey's recollections of war time medicine and surgery so scant. About 1850 he lived in a house on Capitol Hill with Congressman Lincoln, and he speaks warmly of the simple manners and kind heart of the future great President; he remembers the ready wit and the flow of anecdote, but gives us, to our regret, no concrete example of either.

The most valuable of the reminiscences are the brief biographies of the founders and distinguished members of the Washington Medical Society. These are written with discrimination and tact, and many of the details brought together by Dr. Busey can be had nowhere else than here. And although Dr. Busey is a staunch supporter of medical etiquette, even on occasions when it seems absurd to the younger generation, still his spirit towards his fellow-physicians is uniformly generous. The book shows everywhere the genial kindliness and old-fashioned courtesy of a style of manners that is passing away—more 's the pity.

The best chapter in the book is the third one, describing the author's life as a student of medicine at the University of Pennsylvania in 1846–48. The account of Dr. Wood is a striking characterization, and hardly less so are Dr. Busey's sketches of the other members of the Hospital Staff and Faculty of the University at that time.

We congratulate Dr. Busey on his book, and wish that other physicians would take their pens and wield them as well as he has done.

The History of Medicine and Surgery in Georgia. By Luther B. Grandby, M. D., Atlanta, Ga. (*Reprinted from the Atlanta Medical and Surgical Journal.*)

At the beginning of the present century the practice of medicine and surgery in Georgia was conducted in the main by uneducated men. In the original thirteen States of the Union, out of 3000 physicians only about 200, or less than seven per cent, were graduates of any medical school. The advance which has been made in the training of medical men during the past ninety-five years is well shown in this interesting paper. Not the least interesting part of the publication is the history of the surgical achievements of Daniell, who first used extension in diseases of the thigh in 1819; Antony, who operated upon a case of empyema in 1823; Banks, who extirpated the parotid gland in 1831; Long, who performed the first operation under ether in 1842; Jeter, who did a laparotomy for rupture of the uterus in 1850; Dugas, who first advocated opening the abdomen in penetrating wounds; Battey and others, who, far from large cities and centers of medical learning, devised and performed operations which were boldly conceived and successfully executed, often without adequate assistance and under trying circumstances. The work is judiciously written, and it is gratifying to notice the absence of a tendency which has marked similar writings to extol Southern medicine and surgery as in all respects more meritorious than medicine and surgery in any other portion of the country. It is all American surgery and is creditable to the whole country.

BOOKS RECEIVED.

King's College Hospital Reports; being the Annual Report of King's College Hospital and the Medical Department of King's College. Edited by N. Tirard, M. D., F. R. C. P., W. W. Cheyne, F. R. C. S., F. R. S., J. Phillips, M. A., M. D., F. R. C. P., W. D. Halliburton, M. D., F. R. S. Vol. I. October 1, 1893–September 30, 1894. 8vo. 1895. 402 pages. Printed by Adlard & Son, London.

A Book of Detachable Diet Lists for Albuminuria, Anaemia and Debility, Constipation, etc., and a Sick-Room Dietary. Compiled by Jerome B. Thomas, A. B., M. D. 24mo. obl. . 1895. W. B. Saunders, Philadelphia.

A Manual of the Modern Theory and Technique of Surgical Asepsis. By Carl Beck, M. D. With 65 illustrations in the text and 12 full-page plates. 1895. 12mo. 306 pages. W. B. Saunders, Philadelphia.

Transactions of the American Pediatric Society, Sixth Session, held in Washington, D. C., 1894. Edited by Dillon Brown, M. D. Vol. VI. 1894. 8vo. 176 pages. Reprinted from the Archives of Pediatrics.

The History of the Pennsylvania Hospital, 1751–1895. By Thomas G. Morton, M. D., assisted by Frank Woodbury, M. D. 4to. 1895. 575 pages. Times Printing House, Philadelphia.

System of Surgery. Edited by Frederic S. Dennis, M. D., assisted by John S. Billings, M. D. Vol. I: The History of Surgery, Pathology, Bacteriology, Infections, Anaesthesia, Fractures and Dislocations, Operative Surgery. 8vo. 1895. 880 pages. Lea Brothers & Co., Philadelphia.

Surgical Bacteriology. By William H. Welch, M. D. Excerpted from A System of Surgery, by American authors. Ed. by F. S. Dennis, M. D.

Antisepsis and Antiseptics. By Charles M. Buchanan, M. D. With an introduction by Professor A. C. Bernays. 16mo. 1895. 352 pages. The Terhune Co., Newark, N. J.

Augusto Tebaldi. Fisonomia ed espressione studiate nelle loro deviazioni con una appendice sulla espressione del delirio nell' arte. Opera corredata da un atlante. 1884. 8vo. Drucker ed Tedeschi, Verona ed Padova.

Jahresbericht über die Fortschritte in der Lehre von den pathogenen Mikroorganismen, umfassend Bacterien, Pilze und Protozoën. Herausgegeben von Dr. med. P. Baumgarten. 9ter Jahrgang, 1893. Erste Abtheilung. 8vo. 304 pages. H. Bruhn, Braunschweig.

OBITUARY.

JAMES BROWN, M. D.

James Brown, M. D., who had been at the head of the Department of Genito-Urinary Surgery since the organization of the Johns Hopkins Hospital, died suddenly on a steamer *en route* for Boston on Sunday, June 16, 1895. He had been in delicate health for several years, and often suffered from severe illnesses which gave his friends much anxiety. During the spring he became infected from an accidental wound received in performing a surgical operation, and for many weeks was in a critical condition. While convalescing, symptoms of pulmonary disease developed which led him to seek a change of climate, and he died upon the journey. He was in his forty-first year.

At a meeting of the members of the staff of the Johns Hopkins Hospital and Dispensary, held June 19, the following resolutions were passed:

Whereas, by the untimely death of our colleague and friend, Dr. James Brown, the medical profession at large, and the Johns Hopkins Hospital more particularly, has been deprived of an earnest original worker and a brilliant and skilful surgeon; be it

Resolved, That while recognizing the great value of the work done by Dr. Brown during his connection with this institution, we have also to deplore the loss of a single-hearted gentleman and of a true friend.

And be it further Resolved, That we would respectfully convey to his sorrowing family the assurance of our earnest sympathy in their bereavement. WILLIAM OSLER,
MARTIN GOODMAN, *Committee.*
F. R. SMITH.

ARTHUR R. OPPENHEIMER, M. D.

Arthur R. Oppenheimer, M. D., assistant resident physician, died suddenly of typhoid fever at the hospital upon April 29, 1895, aged 22 years. He was completing his term of service and was planning to go abroad for several years of study when stricken down by disease.

At a meeting of the medical staff of the Johns Hopkins Hospital, after appropriate remarks by Drs. Osler, Welch and others, the following resolutions were unanimously adopted and copies were ordered to be sent to his parents and to the daily press:

Whereas, Providence has taken from our midst our friend and associate, Arthur Rosewald Oppenheimer, M. D., therefore be it

Resolved, That we, the medical staff of the Johns Hopkins Hospital and his associates and fellow-students, desire to express our profound sorrow at the loss of one whose simple and lovable nature had so endeared him to his friends, and whose unusual abilities seemed to have fitted him for so brilliant a future.

And be it further Resolved, That we express our heartfelt sympathy to his bereaved family. W. H. WELCH, *Chairman.*
W. S. THAYER, *Secretary.*

NOTICE.

All inquiries concerning the admission of free, part pay, or private patients to the Johns Hopkins Hospital should be addressed to Dr. Henry M. Hurd, the Superintendent, at the Hospital.

Letters of inquiry can be sent, which will receive prompt answer, or personal interviews may be held.

Under the directions of the founder of the Hospital the free beds are reserved for the sick poor of Baltimore and its suburbs and for accident cases from Baltimore and the State of Maryland. To other indigent patients a uniform rate of $5.00 per week has been established. The Superintendent has authority to modify these terms to meet the necessity of urgent cases.

The Hospital is designed for cases of acute disease. Cases of chronic disease are not admitted except temporarily. Private patients can be received irrespective of residence. The rates in the private wards are governed by the locality of rooms and range from $20.00 to $35.00 per week. The extras are laundry expenses, massage, the services of an exclusive nurse, the services of a throat, eye, ear and skin or nervous specialist, and surgical fees. Wherever room exists in the private wards and the condition of the patient does not forbid it, companions can be accommodated at the rate of $15.00 per week.

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BULLETIN

OF

THE JOHNS HOPKINS HOSPITAL.

CONTENTS.

THE TREATMENT OF DIPHTHERIA BY ANTITOXIN.*

BY WILLIAM H. WELCH, M. D., *Pathologist to the Johns Hopkins Hospital and Professor of Pathology, Johns Hopkins University.*

I shall endeavor in this paper, after a brief historical introduction, to present some of the more important general considerations bearing upon the treatment of diphtheria by antitoxic serum, together with statistics of results already reported, with the expectation that those who are to follow in this discussion before the Association will be able to offer the results of personal experience in the application of the new remedy.

In July, 1889, Babès and Lepp, in an article entitled "Recherches sur la Vaccination Antirabiques,"† published results of experiments undertaken to solve the question "whether the fluids and cells of animals which have been rendered by vaccination immune have not become vaccines and capable of protecting also other organisms." The results of these experiments showed that the blood of dogs thoroughly vaccinated against rabies, when injected into susceptible animals, conferred a certain amount of protection against the effects of subsequent inoculation with the rabid virus, and appeared capable of preventing the development of rabies

even when the injection of the immune blood was made immediately after the reception of the virus. The authors concluded that "one must admit the possibility of vaccinating with the fluids and cells of animals which have been rendered refractory to the disease."

The first publication clearly demonstrating the principles of serum therapy was made by Behring and Kitasato on December 4, 1890, in an article in the Deutsche medicinische Wochenschrift entitled "Ueber das Zustandekommen der Diphtherie-Immunität und der Tetanus-Immunität bei Thieren." Although in this article the immunizing and curative property of the blood and blood serum of artificially immunized animals was demonstrated only for tetanus, the application of the same principle to diphtheria was indicated in the same article and in a second paper by Behring in the following number of the same journal.

The first public announcement of the demonstration of the power of the blood serum of animals artificially immunized against diphtheria to protect and cure susceptible animals inoculated with the diphtheria bacillus or its poison, was made by Behring in the report of experiments made by himself and Wernicke, and communicated to the Seventh International Congress of Hygiene and Demography held in London in August, 1891. There followed in 1892 the article by Behring and Wernicke,‡ in which these experiments were fully

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* This paper is based upon the address at the opening of the discussion on this subject before the Association of American Physicians at the meeting held in Washington, D. C., May 31, 1895. I have endeavored to bring the paper up to the date of sending it to the printer (July, 1895).

† Babès and Lepp, Annales de l'Institut Pasteur, July, 1889. Richet and Hericourt are sometimes quoted as the first experimenters to show that the blood of animals is capable of conferring protection upon susceptible animals, but their work has no reference to modern serum therapy, as their experiments were made with the blood of dogs which had not previously been vaccinated or treated in any way.

‡ Behring und Wernicke, Ueber Immunisirung gegen Diphtherie Versuchsthieren bei der Diphtherie. Zeitschrift für Hygiene, Bd. XII.

described and which sets forth the fundamental principles underlying serum therapy of diphtheria.

The first trial of immune serum in the treatment of human diphtheria was made in von Bergmann's clinic in Berlin in the autumn of 1891. This trial, together with those made in 1892 by Henoch in Berlin, by Heubner in Leipzig, and in the Institute for Infectious Diseases in Berlin, were of a tentative nature and made with weak serum and insufficient doses.

It was not until early in 1893 that Behring succeeded in obtaining anti-diphtheric serum equaling the strength of even his so-called normal serum, of which sixty times the strength is that of the weakest Behring's serum at present in use. In April, 1893, Behring referred to 30 cases treated with this normal serum. Of these cases, 11 treated in the Institute for Infectious Diseases were reported in detail by Kossel.

From this period on Behring and Ehrlich succeeded in obtaining healing serum of greater and greater strength, until in August, 1893, Ehrlich and Wassermann obtained from goats healing serum twenty to sixty times the strength of Behring's normal serum. At the Eleventh International Medical Congress held in Rome (March 29 to April 5, 1894) Heubner reported the results of his experience with the serum treatment of human diphtheria. His observations, however, were on cases treated with much weaker antitoxin than is now recognized as suitable.

In April, 1894, Ehrlich, Kossel and Wassermann reported briefly the results of serum treatment of 220 cases in six Berlin hospitals, the inception of the treatment in these cases dating from June, 1893, but the great majority of the cases occurring after December, 1893. These cases, with additional ones making a total of 233 cases with a mortality of 23 per cent., were reported more fully in an article by Kossel in the Zeitschrift für Hygiene in July, 1894. The era of serum treatment of human diphtheria by approximately sufficient doses of antitoxin really begins with this publication of Ehrlich, Kossel and Wassermann in April, 1894, although even in this series of cases, according to later statements of Ehrlich and Kossel, a large number of the cases were treated with quantities of antitoxin which we now consider to be insufficient.

In an address before the Berlin Medical Society on June 27, 1894, Katz reported the results of antitoxin treatment dating from March 14, 1894, with Aronson's serum from horses on 128 cases of diphtheria in Baginsky's service. In the discussion on this address four weeks later Baginsky completed the series of cases up to 163 with a mortality of 12.9 per cent., and Aronson stated that similarly favorable results had been obtained by Ganghofner in Prague and Escherich in Graz.

In 1893 and the first half of 1894 various articles appeared concerning the preparation of antitoxin, the best methods of estimating its strength, the proper immunizing and therapeutic doses, and similar questions. Since August 1, 1894, Behring's serum prepared at Höchst has been for sale.

It is evident from this brief historical summary that the general principles of serum therapy of diphtheria were fully established and its application to human beings in active operation before Roux delivered his memorable address on the subject at the Eighth International Congress of Hygiene and Demography held in Budapest, September 1-9, 1894, three years after Behring's original communication to the preceding Congress in London. Roux, however, presented the subject with such clearness and force, and with such an array of convincing and carefully analyzed statistical evidence, that the attention of the great body of physicians throughout the world, who had paid little heed to the previous work, was arrested, and the question of the healing power of diphtheria antitoxin became and has continued to be the foremost medical question of the day. From September, 1894, onward the supply of antitoxin from various sources (not all of equally trustworthy character) has become more and more accessible to physicians, and each succeeding month has given birth to a large number of articles on the serum therapy of diphtheria from various parts of the world.

Unless one denies absolutely the causal relation of the Löffler bacillus to diphtheria, it must be admitted that the treatment of this disease by antitoxin rests upon a sound experimental basis. The only notable opponent of the view that the Löffler bacillus is the cause of diphtheria is Hanseman. His arguments, which have been well answered by C. Fraenkel, are equally applicable to the acceptance of the etiological relations of the cholera bacillus, the tubercle bacillus and many other specific bacteria of infectious diseases. It is not probable that any one here sides with Hanseman in this matter, so that it is unnecessary to rehearse the arguments, which in my judgment are conclusive, that the Löffler bacillus is the cause of diphtheria.

The laboratory does not furnish any more impressive experiments than those which demonstrate the power of antitoxic serum to prevent and to cure the disease caused in animals by inoculation with the diphtheria bacillus or its poison. The serum arrests the spread of the local process and abates the symptoms of general toxæmia. These experiments prove beyond question that this healing serum possesses properties which are directly and powerfully antagonistic to the toxic action of the diphtheria bacillus, and there is no good reason to doubt that under similar circumstances this antagonistic power, so readily and surely and uniformly demonstrable in the case of lower animals, will manifest itself also in human beings. The only question, and that of course an important one, in this connection is: To what extent the conditions in the treatment of experimental diphtheria by antitoxin are or can be made similar to those in the therapeutic application of the same agent to human diphtheria?

Although it is true that the lower animals are not susceptible, or only very exceptionally susceptible, to natural infection with the Löffler bacillus, still there is in my opinion identity in essential points, anatomical, clinical and etiological, between experimental diphtheria and uncomplicated human diphtheria. The assertion sometimes made that spreading pseudo-membranous inflammations resembling those of diphtheria cannot be produced experimentally in animals by inoculation with the Löffler bacillus is an error, as I have repeatedly had opportunity to demonstrate by intratracheal inoculations of kittens and rabbits. It is rarely in our power to reproduce experimentally in one species of animal the exact counterpart of a disease caused in another by natural modes of infection,

but in the case of diphtheria the resemblance is closer than in most of our attempts to reproduce such diseases by inoculation of their specific germs.

But even if the anatomical and clinical characters of experimental diphtheria are believed by some to differ more widely than I think they do from those of human diphtheria, there remains as the most important point, regarding the matter here under discussion, the conclusive demonstration that in uncomplicated human diphtheria no less than in experimental diphtheria the local inflammation at the site of infection is caused by the growth of the Löffler bacillus, and the lesions of internal parts and the systemic symptoms are due to the absorption of a toxic substance or of substances formed by this bacillus. It would be difficult to understand why an agent with the specific property of neutralizing in the bodies of animals the effects of these toxic substances should be unable to neutralize in human beings similar effects of the same toxic substances, provided this agent can be administered in the proper dose and at the right time.

Dosage and timely administration are factors of prime importance in determining the efficacy of antitoxic treatment. It is our inability to conform to the demands of these factors which has rendered thus far the treatment of tetanus in human beings by antitoxin disappointing. The tetanus antitoxin can be produced by methods similar to those employed in making the diphtheria antitoxin, and of a power expressed in immunizing units greater than that of the diphtheria antitoxin. No less striking than in diphtheria are the laboratory experiments in the prevention and cure of artificial tetanus by administration of the tetanus antitoxin, but in this case the dose of antitoxin required to check the disease increases so enormously with increase in the size of the animal, on the one hand, and with the lapse of time after reception of the virus on the other hand, that we meet herein most serious obstacles to the successful application of this agent in the treatment of human tetanus.

It has been shown experimentally by Behring, Boer, Roux and others that as regards both of these points the conditions are far more favorable for the treatment of diphtheria by its antitoxin than in the case of tetanus. In an animal, at a certain time after reception of the tetanus poison, the theoretically efficacious dose of the tetanus antitoxin may be a million-fold greater than that required for simple immunization, a quantity too large to administer; whereas the effective dose of the diphtheria antitoxin at relatively the same period may be increased only eight or ten-fold. Doubtless the great advantage which we have in the treatment of human diphtheria by antitoxin as contrasted with tetanus is that we are able to recognize and treat the former disease before the production and absorption of a serious quantity of poison.

Only clinical experience can determine what practical difficulties there may be in the way of the successful employment of antitoxic serum in the treatment of human diphtheria, but there is no doubt in my mind that the results derived from experiments on animals justify, nay, demand, the most careful and thorough trial of the new method of treatment upon human beings.

We have no certain knowledge as to the nature of the substances called antitoxins nor as to their mode of action. This is not, however, an argument against their therapeutic employment, for we have no positive knowledge as to the mode of action of many of our therapeutic agents. There are two prominent theories as to the mode of action of the diphtheria antitoxin. The one may be called the chemical and the other the vital theory. The chemical theory is that the antitoxin directly neutralizes in a chemical sense the toxins. This seemed to be the natural interpretation of the fact that the injection into susceptible animals of a mixture in suitable proportion of the antitoxin and the toxin is harmless, but Buchner and Roux have shown that this earlier view is incorrect, and that by selecting animals of greater susceptibility or by increasing the natural susceptibility of an animal, the presence of active toxin in the mixture can still be demonstrated. The experimental evidence, therefore, is in favor of the other theory, viz. that the antitoxin acts through the agency of the living body, and probably in the sense that it renders the cells tolerant of the toxin.

The results of the treatment of human diphtheria with antitoxin speak also in favor of this vital theory.

If, as seems probable, the curative effects of the healing serum are brought about through the agency of the living cells of the body, we can understand why these effects will not follow the introduction of the serum with the certainty and precision of a chemical reaction. The cells must be in a condition to respond in the proper way to the introduction of the antitoxic serum. For one reason or another this responsive power may be in abeyance. It may be weakened by intense or prolonged action of the diphtheria poisons, or by other previous or coexistent disease, or by inherent weakness, or there may even be some individual idiosyncrasy which hinders the customary response of the cells to the antitoxin. Clinical experience shows that cases of diphtheria inherently refractory to timely treatment with antitoxic serum are most exceptional, if indeed they occur at all.

There is some evidence in favor of the view that while antitoxin may exert its protective action upon certain groups of cells, other cells, as for example the nerve cells, may, either by their nature or on account of such influences as I have mentioned, not be equally protected against the toxin. There is also the possibility that antitoxin may neutralize the effects of certain toxins and not of others present in diphtheria.

Antitoxic serum exerts no bactericidal effect upon the diphtheria bacillus, although, when administered in proper quantity, sufficiently early in the disease, it arrests the spread of the local inflammation which is caused by the bacillus. Virulent bacilli may persist in the throat days and even weeks after recovery following injection of antitoxin.

One of the most important ... requires a definite quantity of this substance to neutralize the effects of a definite quantity of toxin. In animals the curative dose of antitoxin stands in a definite quantitative relation to the size and susceptibility of the individual, and to the amount and intensity of the poison in the system. We have no precise method of determining how much and how virulent the poison may be in a given case of human diphtheria, how susceptible to the toxin the patient may be. The dosage

of antitoxin, therefore, in human diphtheria is empirical, the main factors determining it being the age of the patient, the assumed duration of the disease up to the time of administering the remedy, and the apparent severity of the disease. As the healing serum is expensive and is capable of inducing unpleasant symptoms, it is desirable not to give an excessive quantity. Under these circumstances it may readily happen that an insufficient dose is given and that the administration must be repeated. The general rules regarding the dosage of antitoxin are sufficiently well known not to require mention here, and I speak of this matter only to indicate that because a patient may have received a dose or even two or more doses of antitoxin, this furnishes no absolute guarantee that a quantity of antitoxin adequate to neutralize the effects of the toxin has been given. We now know that in the early period following introduction of the treatment entirely insufficient doses were given.

Both experiments on animals and clinical experience demonstrate that the earlier antitoxic serum is administered after the inception of the disease, the better are the chances of recovery. It is usually impossible to rescue the lives of guinea-pigs by means of antitoxin if the treatment is delayed longer than forty-eight hours after inoculation with an amount of diphtheria poison fatal to these animals in four or five days, although the duration of life may be considerably prolonged. In human beings the conditions are different, but, as will appear from the statistics to be presented, the evidence is conclusive that the superiority of serum treatment over all other methods is most strikingly manifested in the results of the cases in which the antitoxin is given not later than the third day of the disease. Although in many cases the treatment is beneficial when the antitoxin is administered in larger doses at a later period of the disease, the importance of beginning the treatment at the earliest possible date, without waiting to determine by cultures whether or not the Löffler bacillus is present, cannot be too strongly emphasized.

It is of course often impossible to meet this demand for early treatment, as cases of diphtheria are frequently not seen or recognized by the physician, particularly in hospital practice, until after several days' duration of the disease and when grave symptoms have already developed. It is, moreover, in many cases difficult or impossible to determine how long the disease has existed when it is first seen by the physician.

The fact that the benefits of antitoxin treatment become more and more doubtful the further the disease has progressed and the graver the lesions and symptoms, renders more difficult the collection and analysis of absolutely convincing statistics in favor of the treatment. The accusation is sure to be brought that many of the cases which have responded promptly to early treatment, and these for reasons which have been stated will form a large contingent of the successful cases, were mild cases which would have recovered equally by other methods of treatment. This objection can be fully met only by large series of statistics collected from many epidemics, at different times and in various localities.

The bacteriological study of human diphtheria has disclosed several points important to bear in mind in determining the value of antitoxic treatment. The Löffler bacillus has been found in healthy throats, although only very exceptionally unless the person has been exposed to diphtheria. This same bacillus may cause all grades of inflammation of the throat, from a mild erythematous angina to the gravest pseudo-membranous inflammations. There has resulted a conflict, not yet settled, between the clinical and the bacteriological diagnosis of diphtheria. As regards these diversities of effect, however, the conditions pertaining to the diphtheria bacillus are in no way different from those relating to many other pathogenic bacteria, as for example the pneumococcus, the streptococcus, the cholera bacillus, and even the tubercle bacillus, all of which may be found on healthy mucous membranes and may exert their pathogenic activity with all degrees of intensity. Inconvenient as these facts may be, they must be recognized, and they require a readjustment of previously adopted boundary lines of diagnosis. It would, of course, be absurd to say that a person who harbors in his healthy throat Löffler bacilli has diphtheria, just as it would be equally ridiculous to consider a person infected with the pneumococcus or the streptococcus when these latter bacteria are present under similar conditions, but it is no less absurd to limit the application of the term "diphtheria" only to those higher degrees of pathogenic action of the Löffler bacillus characterized by spreading pseudo-membranous inflammations and general toxæmia.

But while the boundaries of the domain of diphtheria have thus been widened by the inclusion of cases not presenting the ordinary clinical characteristics of diphtheria, in another direction they have been restricted by the exclusion of some cases which on clinical grounds would be diagnosed as diphtheria but which by bacteriological examination are proven to be caused by other bacteria than the Löffler bacillus.

The statement is sometimes made that twenty-five to thirty per cent., or even a larger percentage of the clinical diphtherias are not genuine diphtheria in the bacteriological sense, but this statement is quite misleading. These figures are based upon the bacteriological examination of large numbers of cases in which there was simply more or less suspicion of diphtheria. They do not relate generally to a large number of cases presenting unmistakable anatomical and clinical characteristics of diphtheria. They are derived from the routine examinations for Boards of Health and children's hospitals of suspected cases of diphtheria. When one considers that in some cases of diphtheria repeated, painstaking examination, microscopical and cultural, by a skilled bacteriologist, is required for the detection of the diphtheria bacillus, it is evident that less reliance is to be placed upon these statistics en gros than upon many smaller series reported by bacteriological experts. Of the statistics of the latter character there are many which show that in the series of cases examined (including in each series from a dozen to over three hundred cases) from ninety to one hundred per cent. of the clinical diphtherias are due to the Löffler bacillus. Our experience in Baltimore has been that not over five per cent. of the cases which the clinician would confidently diagnose as diphtheria are false diphtheria or diphtheroid. These latter figures relate, of course, to primary diphtheria and not to the pseudo-membranous anginas complicating scarlet fever and

other infectious diseases, a large proportion of which are not referable to the Löffler bacillus.

I shall consider subsequently in this article the influence which the control of the clinical diagnosis of diphtheria by bacteriological examination is likely to have upon fatality statistics of this disease.

There is an important difference between experimental diphtheria and many cases of human diphtheria, a difference of great significance in determining the scope of efficiency of treatment by antitoxic serum. Our experimental diphtheria is a pure, uncomplicated infection in which only the diphtheria bacillus and its toxins are concerned. On the other hand, in many cases of human diphtheria there are complications and mixed infections due to other micro-organisms against which, when duly developed, the diphtheria antitoxin is powerless. The most common and dangerous complicating micro-organism is the streptococcus pyogenes. Bacteriological examinations of fatal cases of diphtheria demonstrate in a large proportion of cases the invasion and pathogenic effects of this most common of all secondary invaders. The confidence with which some observers, particularly of the French school, classify their cases of diphtheria into pure and mixed infections, on the sole basis of the bacteriological examination of the exudate in the throat, does not seem to me justifiable. The complete microscopical and cultural examination of this exudate will in practically all cases reveal the presence of other bacteria, and usually of streptococci, besides the Löffler bacillus. But as these other bacteria are common or regular inhabitants of the healthy throat, their mere presence in this situation is not conclusive evidence that they are engaged in pathogenic action. The abundance of these other bacteria may afford some indication as to their rôle, but of greater importance is their demonstration in situations where they are not normally present.

Reiche,[*] in 42 autopsies on cases of diphtheria in which the Löffler bacillus had been demonstrated during life, made cultures from the kidney and spleen. In 64.3 per cent. of these cases streptococci and staphylococci were found in the kidney or spleen, and in 45.2 per cent. streptococci were found alone. These cocci must have reached these organs through the circulating blood. He found streptococci in the kidney in one case which died on the second day of the disease, and positive results were obtained also on the third and fourth day. These results are evidently of much significance in indicating the frequency and the earliness of invasion of complicating micro-organisms in diphtheria and the resulting obstacles to uniformly favorable results of antitoxin treatment.

But the chief evidence in favor of mixed infection must be sought during life, in the character of the lesions and symptoms, although these may be misleading. There is also evidence that the failure of a case of diphtheria to respond in the usual way to the timely injection of a sufficient dose of antitoxic serum is an indication of complications and mixed infection.

The opinion is entertained by Roux, Martin and other

French writers that broncho-pneumonia, one of the most common and serious complications of diphtheria, is due to a large extent to local unhygienic conditions which can be guarded against. Thus they attribute the frequent occurrence of broncho-pneumonia in some groups of their cases to the infection of the hospital wards with the bacteria causing pneumonia, and claim that by improved sanitary conditions this complication may be to a large extent eliminated. Further investigations are needed to determine to what extent this view as to the causation of broncho-pneumonia is justified, but it can scarcely be doubted that this complication is often the result of invasion of the lower air passages and the lungs by bacteria which are regularly present in the throat, and whose activity is likely to be manifested in this way in many cases of diphtheria, independently of the local sanitary conditions.

Without doubt the remedial rôle of diphtheria antitoxin is materially restricted by its inability to combat developed streptococcus sepsis, broncho-pneumonia and other complications referable to secondary infection, or to stop impending suffocation by immediate removal of mechanical obstacles in the form of false membranes in the air passages, but the antitoxic serum is the most powerful agent which we possess to prevent the development of these complications and secondary infections. The timely administration of the healing serum, by antagonizing the effects of the Löffler bacillus, antagonizes in large part the causes of the increased susceptibility to secondary infections and thus greatly lessens the frequency of their occurrence.

In considering the obstacles in the way of cure of diphtheria by antitoxin, the self-evident fact should not be forgotten that this remedy cannot restore cell life which has already been seriously damaged by the action of the diphtheria bacillus or its poison. The researches of Oertel upon human diphtheria, and those of Flexner and myself upon experimental diphtheria, demonstrate that the toxins of the diphtheria bacillus are most powerful poisoners of cells, the internal lesions of pure diphtheria being especially characterized by widely distributed areas of cell death. We have no way of gauging accurately at any given period of the disease the extent of the damage already inflicted upon the cells of the body. If the nerve cells or their axis cylinders have already been so damaged that paralysis must follow, or the cardiac nerve cells or muscular fibres have been similarly injured, or the renal epithelium so affected that degeneration and nephritis ensue, the administration of antitoxin cannot restore these cells which are already on the way to degeneration and death.

This irretrievable damage to cell life may be present for a considerable time before we are able to recognize its effects. P. Meyer detected pathological changes in the peripheral nerves as early as the third day after the onset of diphtheria and before paralysis was manifest. The occurrence of paralyses, including cardiac paralyse, after antitoxin has been administered even thus early in the disease, cannot therefore necessarily be attributed to failure of this agent, inasmuch as toxin developed after its injection.

Having now considered the experimental basis and the

*Reiche: Centralblatt f. innere Medicin, 1895, No. 3.

theories of action of antitoxic treatment, the importance of early administration and sufficient dosage, and certain etiological and pathological characters of human diphtheria to be borne in mind in estimating the scope of the treatment, let us turn to the examination of the evidence which has hitherto been published concerning the efficacy of the antitoxic treatment of human diphtheria. This evidence is of two kinds, first, the general impressions of clinicians who have had opportunity to observe the effects of antitoxin administered in a number of cases of diphtheria, and second, the fatality statistics of cases treated with antitoxin.

Unquestionably great value attaches to the impressions and conclusions of careful clinical observers as to the merits of therapeutic agents. Baginsky has said that naked figures are so little the expression of the endless variations of clinical observation, of all those fortunate and unfortunate accidental circumstances which pertain to the constitution and nutrition of the patient, and of the complications and difficulties which may bring danger in a mild attack, or lead to a successful issue an apparently severe attack, that to the clinical observer such figures appear of little value in comparison with the treasure-house of his accumulated experience. And it is to his experience of many years in the same hospital and on similar clinical material that Baginsky repeatedly recurs in his monograph "Die Serum-therapie der Diphtherie," in support of his favorable conclusions as to the healing power of antitoxin, and this in spite of the fact that his statistical results, leading to the same conclusions, are based upon a larger number of cases than those of any other single observer yet published, and are among the most convincing of the statistical reports. In explaining why at the end of ten months' trial of antitoxin he has determined to commit himself to a definite judgment in its favor, he says: "The reasons for this are to be found in the continual repetition of improvement and recovery of severe cases which previous experience indicates would have terminated fatally; and furthermore, in the outcome of an involuntary experiment with interruption of the use of the serum for a period on account of failure in its supply. During this period the mortality of our patients immediately rose again to its former height." "The improvement in the general condition of the patients imparts to our diphtheria wards an entirely different character from the former one. That this is not due to any change in the character of the clinical material, to milder forms of the disease, was unfortunately demonstrated by the observations in the months of August and September, when, as by a single blow, we were transported back to the old times, to the same melancholy picture of children deeply prostrated and often in vain struggle with death." In August and September the supply of antitoxin failed.

The published testimony of those who have had the largest opportunity to study the therapeutic effects of antitoxin is overwhelmingly in its favor. In no less favorable terms than those of Baginsky are expressed the opinions of such observers of high reputation and extended experience as Heubner, von Widerhofer, von Ranke, Ganghofner, Escherich, Bokai and the physicians of the Hôpital des Enfants-Malades and Hôpital Trousseau in Paris. These observers have reported already in detail over 2300 cases of diphtheria treated with antitoxin.

Many of those who have reported smaller series of cases, and a few who have reported as many as a hundred cases, have expressed themselves with much caution or have not ventured any final judgment, although in most of these reports the results appeared to be favorable to the new treatment. An example of this conservative position is that of Vierordt, who says that a final decision as to the value of antitoxic serum is not to be expected in the immediate future, as such decision requires a long series of observations in different epidemics and on varied clinical material.

Antitoxic serum is a new and strange remedy, but the effects which follow its injection in individual cases are not new and strange. Nothing happens which the physician may not have occasionally seen to happen in cases treated in the ordinary way. In severe as well as in mild cases of diphtheria he may have seen an apparently progressive local process quickly arrested and the general symptoms promptly abated. But why should anything new and strange happen after the administration of antitoxin? Cure by antitoxin is cure by nature's own remedial agent. That which is new and strange is the frequency with which in case after case the timely injection of antitoxin promptly arrests the local inflammation and checks the constitutional disturbance.

Recovery following treatment by antitoxin is such a natural kind of recovery that in any given case the physician may readily have the feeling that the same thing might have happened without the use of the remedy. We can, therefore, understand why it should be those with the largest experience in the treatment of diphtheria by antitoxin who are most decided in expressing their opinion as to its beneficial effects. The very fact that the mode of cure is such a natural one and unattended by peculiar phenomena is an obstacle to drawing positive conclusions from a small number of observations, even if these appear to be most favorable.

That there should be wide diversity in the percentage of cures in reports of different observers is of course to be expected when we consider the varied character of the cases treated and the importance of early administration of antitoxin. It may happen that a series of cases is made up so largely of advanced and complicated diphtherias at the time when the antitoxic treatment is begun, that the beneficial effects of the treatment are not apparent. It is on the whole remarkable that there should have been so few reports in which the fatality has not been materially diminished during the period of administration of antitoxin.

There are only very few writers who on the basis of personal experience (and this in no instance a large one) have expressed an opinion unfavorable to antitoxin. Kohts may be mentioned as one who on the basis of 47 cases treated with serum, with 29.1 per cent. deaths among the tracheotomized and 7.6 per cent. among the non-tracheotomized, finds such apparently favorable results no better than by other methods of treatment.

So far then as the testimony of physicians based upon their clinical experience is concerned, this, as I have already said, is overwhelmingly in favor of the antitoxic treatment, wherever

their experience in its employment has been a large one. Those with less experience are often even more enthusiastic, but many of these, in view of their limited experience, are wisely conservative and a few are hostile to the new treatment.

But general clinical impressions, convincing as they may be to the individual receiving them, may not be equally convincing to others. They do not furnish any strict scientific proof of the value of a therapeutic agent. If antitoxin really exerts any specific curative action in diphtheria this must be apparent in the figures of fatality statistics of this disease, and it is only by such statistics, much as they may be decried by some, and difficult as it may be to guard them from errors of interpretation, that a strictly scientific demonstration of the efficacy of antitoxin in the treatment of diphtheria can be brought.

The possible fallacies of interpretation belonging to fatality statistics in general apply in no small measure to those of diphtheria. The case mortality from diphtheria varies within wide limits according to the more or less severe character of the prevailing epidemic, according to the season of the year, according to the age, according to the method of treatment, in cities and in country districts, etc. Statistics of case mortality from hospital practice will differ widely from those from private practice, and each of these will differ from the general case mortality returns from cities. Nor does each of these three classes of statistics represent a uniform material. The material of one hospital may consist very largely of cases of diphtheria admitted in an advanced stage of the disease, or of laryngeal cases sent for operation, while that of another hospital may contain a much larger proportion of cases admitted in early stages of the disease. In general the fatality of diphtheria in hospital practice is higher than that of private practice, as would be expected from the later stage of the disease in which the patients generally enter the hospital; but to this rule there are many exceptions. In some hospitals the patients are all children, in others there may be a considerable proportion of adults with diphtheria. In private practice among the poor, patients may be first seen by the physician frequently in as advanced stages of the disease as in hospitals, and the conditions for successful treatment, and particularly for intubation or tracheotomy, are less favorable for this class of private patients than for hospital patients.

Still other reasons might be given for the lack of uniformity of diphtheria statistics from different sources, but enough has been said to show that as regards the question which interests us here, each report of a series of cases treated with antitoxin requires its own special consideration and analysis and is not comparable with reports from other sources relating to a different class of cases.

The larger the number of cases embraced in the statistical tables, the greater becomes the mutual compensation of such differences as those mentioned, and therefore the more trustworthy are the conclusions derived from the statistics; but in collecting the statistics of the general fatality of diphtheria treated with antitoxin it has seemed to me important, for the reasons which have been mentioned, that the tables should contain for each report, as far as possible, statements of the total number of cases treated with antitoxin, of the num-

ber and percentage of deaths, of the previous or simultaneous fatality, and of the class of cases, whether in hospital or in private practice. I have also analyzed the cases so far as practicable according to the ages of the patients and according to the day of the disease on which antitoxin treatment was begun. It has seemed to me of especial interest to consider the fatality in operated and not operated cases. There are of course many other points of view which it would have been interesting to consider in the statistical study of the cases reported, but it has seemed to me that the analysis already indicated should suffice to determine the main question at issue, namely, the specific curative power of antitoxin, as well as certain other questions.

It is scarcely ten months since antitoxin has been used by more than a very few favored physicians, and it is a much shorter time since its use has become at all general. In this comparatively short time there have, however, been published more or less definite reports of the results of the treatment in at least 15,000 cases. I have collected 82 reports from 80 different sources containing 7166 cases. These are presented in Table I. This collection of cases is by no means complete, as I have consulted only the more readily accessible journals, but it is believed to include all of the more important reports. I have not included any reports of single cases, as these are often to illustrate some special point, nor any reports of series of cases less than ten. Indeed only four reports with less than 12 cases in the group have been included in the tables. Nor have I made use of such merely general published statements without detail as that there have been treated in France up to the end of December 2700 cases with a mortality of 16 per cent., in Austria outside of Vienna 950 cases with a mortality of 15.7 per cent., in Croatia and Slavonia 428 cases with a mortality of 10.8 per cent., in Berlin hospitals 1500 cases with a reduction in fatality of one-half, etc.

Eulenberg has recently (July 15, 1895) made a provisional report concerning the collective investigation inaugurated by the Deutsche medicinische Wochenschrift by sending out cards to be filled out by physicians regarding their results in the treatment of diphtheria with and without serum. Up to the date of the report the cards returned embraced 10,240 cases of diphtheria, of which 5790 were treated with serum and 4450 without serum. The total fatality of the former group was 9.5 per cent., that of the latter group 14.7 per cent. No further details of this investigation have as yet been published, and these cases are not included in my tables.

I have entirely avoided the duplication of cases, so far as I can determine.* There has been no selection whatever of cases. All of the reports of the characters described which came to my notice are included, although many of the early

* This duplication of cases appears in several of the published statistics, especially of the Berlin statistics. Thus the cases reported by Schubert V. swineket, Vissen and Wyllyes appear in the reports of Ehrlich, Kossel and Wassermann, and partly in the reports of Körte, Sonnenburg and Hahn, sometimes twice repeated. Most of these cases are included without duplication, in my table, although they were treated with insufficient doses in a great number. The cases attributed to Virchow, Aronson and Katz in some statistics are included in those of Baginsky.

Berlin cases (contained in statistics of Körte, Sonnenburg and Hahn in my tables) and some of the others were treated with entirely insufficient doses of antitoxin, and some observers have purposely selected, especially at the time when little serum was to be had, only severe cases for treatment. Kohts' 47 cases could not be inserted, as in the report which I have seen he does not give the number of deaths.

The reports are of unequal value. Some present full and precise details of each case or of the group of cases, with statements as to previous or simultaneous fatality in the same class of cases in the same locality, whereas others are meagre and unsatisfactory.

Some reports are based upon the bacteriological control of the clinical diagnosis, others upon the clinical diagnosis uncontrolled by bacteriological examination. In general the statistics from the larger hospitals relate to cases in which the Löffler bacillus was demonstrated, whereas many of the reports from private practice are without bacteriological examination. A few, notably Leichtenstern and Wendelstadt, purposely base their observations upon cases in which the diagnosis is purely clinical without bacteriological control.

I shall take this opportunity to consider the influence which the requirement of the bacteriologist, that the clinical diagnosis of diphtheria should be controlled by a bacteriological examination in testing the efficacy of antitoxin treatment, is calculated to have upon the characters of statistics intended to show the value of the treatment. It is a favorite criticism of these statistics that the bacteriological, as distinguished from the purely clinical, diagnosis of diphtheria will operate in favor of a low fatality in antitoxin statistics, and that therefore it is unfair to compare these statistics, with those which are based upon the uncontrolled clinical diagnosis of diphtheria. Some of the critics would have us believe that the antitoxin statistics on the one hand contain a large proportion of cases of mild inflammation of the throat with Löffler bacilli, but which no clinician would recognize as diphtheria, and on the other hand exclude a large proportion of fatal pseudo-membranous inflammations of the throat and air passages which clinically would be regarded as diphtheria.

In most of the statistical reports from hospitals on antitoxin treatment the statement is expressly made, and it is apparent from the description of the cases, that they do not represent anything else than the usual run of cases of diphtheria as they have regularly for years past presented themselves at the same hospitals. The mild diphtheric sore throats without clinical evidences of ordinary diphtheria are not likely in any large number to be recognized at all as diphtheria, and still less likely to find their way into general hospitals, from which most of the statistics are derived. Where, as in the statistics of Baginsky and others, sufficient detail concerning each case is reported to enable the reader to form an intelligent estimate of the character and severity of the case, it is evident that affections without the customary anatomical and clinical characters of diphtheria do not enter into the statistics.

It is erroneous to say that the antitoxin statistics are not based upon the clinical diagnosis of diphtheria. The diagnosis is clinical, but with subsequent bacteriological control.

The cases are admitted to the hospital with the clinical diagnosis of diphtheria, and the healing serum is or should be at once administered without waiting for the result of the cultures from the throat. Soltmann has been justly criticised for delaying the injection of antitoxin until after the bacteriological examination was completed.

The assumption that non-membranous anginas and tonsillitis containing Löffler bacilli figure to any appreciable extent in these statistics is without warrant of facts.

There are treated of course together with severe cases many mild cases with small patches of membrane on the tonsils or in the throat, but such cases are clinically diphtheria, or certainly ought to be suspected of diphtheria by the clinician. It is important that such cases, when caused by the Löffler bacillus, especially in young children, should be treated by antitoxin, for not a few such cases when untreated develop into severe cases, sometimes suddenly into laryngeal diphtheria. Kurth, for example, relates a case in which a twin brother of a child ill with diphtheria was found to present small membranous patches on the tonsils which during two weeks of observation would at times disappear and which did not apparently make the child ill. Löffler bacilli were demonstrated, but the parents would not consent to the injection of serum. At the end of fourteen days, laryngeal diphtheria suddenly developed. The injection of antitoxin was followed by recovery in four days. This is simply a type of not a few cases which are regarded as suddenly developed laryngeal diphtheria.

If, as is doubtless true, in some hospitals a larger number of cases are now received for serum treatment in earlier stages of diphtheria than formerly, this is not because the bacteriological diagnosis has supplanted the clinical, but because the importance of early inception of serum treatment has been justly emphasized. The recognition of mild and very mild cases of diphtheria is not a discovery of the bacteriologist, but has long been known to physicians, nor is it a peculiarity of the fatality statistics of cases treated by antitoxin that such mild cases are included in the statistics. They appear equally in previous fatality statistics of diphtheria. Mosler, for example, reports 313 cases of diphtheria with a fatality of 14.5 per cent. treated during a year in the Greifswald clinic before the introduction of serum, and there are numerous other statistics showing that mild cases often preponderate in previous fatality statistics of diphtheria. Nor is the comparison in all of the reports with statistics in which the diagnosis is without bacteriological control. In several reports the comparison is with the results of cases in which the Löffler bacillus was demonstrated, but which were not treated with serum.

As regards the exclusion from antitoxin statistics of cases presenting the clinical characters of diphtheria without the Löffler bacillus, it is evident, from what has previously been said, that, with thorough bacteriological tests, this can affect only a very small number of cases of unmistakable primary clinical diphtheria. Of the cases concerning which the clinician is in doubt, a considerable proportion are not diphtheria by bacteriological examination, which alone can decide the question. Although some of the non-diphtheric, pseudo-membranous cases are very grave affections, their general

fatality is much lower than that of genuine diphtheria. The exclusion from the fatality statistics of diphtheria of the pseudo-membranous cases without Löffler bacilli is, therefore, the exclusion of a generally milder class of cases, as has been repeatedly demonstrated, and the result is to assign a higher and not a lower fatality to the remaining cases. A few examples taken from reports in Table I will suffice to demonstrate this. From the statistics of Roux, Martin and Chaillou 128 pseudo-membranous cases treated with serum were thrown out because they were proven subsequently to be devoid of Löffler bacilli. The fatality of these cases was only 8.5 per cent., whereas in the 300 remaining cases which contained Löffler bacilli and were injected with serum the fatality was 26 per cent. In Sevestre and Meslay's statistics 29 cases without Löffler bacilli, but treated with serum, gave a fatality of 3.4 per cent. as opposed to a fatality of 10 per cent. in the treated cases containing Löffler bacilli. A similar difference appears in other reports. The serum has no curative influence on pseudo-membranous inflammations not caused by the Löffler bacillus.

In the best reported statistics information is afforded as to these various points, and the reader can learn the ratio of apparently mild cases and the number and results of the diphtheroid cases.

Although only those statistics which are based upon the thorough bacteriological examination of the cases treated can lay claim to entire accuracy, the benefits of antitoxic treatment are clearly apparent in reports based upon the uncontrolled clinical diagnosis of diphtheria. Of course in ordinary general practice it is not to be expected that the diagnosis will rest upon a bacteriological examination, but it should be understood that in the absence of such examination there must be occasional instances of apparent failure of antitoxin which would be found explicable had a bacteriological examination been made.

In many reports the percentage of deaths in the cases treated with antitoxin is corrected by excluding cases evidently hopeless on admission or dying within twenty-four hours after commencement of the treatment. These corrected percentages are usually very materially lower than the rates based on all of the deaths. For example, if the cases dying within twenty-four hours after injection of antitoxin be excluded, the percentage of deaths in Roux, Martin and Chaillou's cases becomes 21.5 instead of 26; in Baginsky's 13.5 instead of 15.6; in von Widerhofer's 14.3 instead of 23.7; in Vierordt's 14.6 instead of 25; in Lebreton and Magdelaine's 10.8 instead of 12; in Moizard and Perregaux's 11.3 instead of 14.7; in Sevestre and Meslay's 6.6 instead of 10; in Bokai's 18.3 instead of 25.5, etc. I have, however, not used these reduced percentages, although in many instances it might with propriety have been done. The statistics in my tables, therefore, do not give in many instances as favorable percentages for antitoxin as may justly be claimed, but on the other hand they are more properly comparable with the previous or simultaneous fatality rates from diphtheria, these being based upon the total number of deaths in all of the cases treated. I have aimed to avoid the accusation of selection of cases or of unfair manipulation of the figures.

In the majority of the reports the cases treated are all or nearly all of the cases of diphtheria which were admitted to the hospital or came under observation during the period of treatment, but in some it is expressly stated that in consequence of the cost and the scarcity of the healing serum mild cases and evidently hopeless cases did not receive the serum. There is no evidence of selection of mild cases in order to obtain results favorable to antitoxin.

The percentages in the column headed "Previous Fatality" are those given by the writers for diphtheria not treated with antitoxin. In some instances they relate to the average fatality for a series of preceding years, in some to the minimum and the maximum fatality for several years, in some to the simultaneous fatality or the fatality during a period of interruption in the supply of serum. In all instances they are the case mortality rates of diphtheria in the hospital or locality from which the cases treated with antitoxin are derived. The arrangement of the reports is only in part chronological. Following the references to the articles, it is stated, so far as could be ascertained, whether the cases were in hospital or in private practice.

It appears from Table I* that of 7166 patients with diphtheria treated with antitoxin 1239 or 17.3 per cent. died. Among these cases are included many treated during the early period after the first introduction of the treatment, with entirely insufficient doses. There are also included a large number of cases dying from complicating diseases not referable to diphtheria, or dying within twenty-four hours after beginning the treatment, cases which cannot properly be regarded as indicating failure of the serum treatment. The great bulk of the statistics come from children's hospitals. Under these circumstances, indeed from any point of view, the fatality derived from Table I of cases treated with antitoxin is very low.

There is, however, no standard of comparison for the fatality in this entire group of cases. It cannot be compared with fatality statistics from hospitals nor with those from private practice. The table contains at least five or six times as many cases from hospital practice as from private practice. The ratio of deaths to all cases, therefore, is greater than could be expected from the returns of all cases similarly treated in cities, but even in comparison with municipal fatality statistics of diphtheria during the prevalence of mild types of the disease, the percentage of deaths is very low. This strikingly low fatality in itself speaks strongly in favor of the efficacy of the serum treatment.

In 46 reports contained in the table the previous or simul-

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* The report of Fürth concerning the results of serum treatment in the medical and surgical clinics at Freiburg was published too late to be included in my tables. 119 cases were treated with a fatality of 12 per cent. During the five preceding years the fatality from ordinary treatment fluctuated between 31 and 33 per cent., averaging 30 per cent. The same average existed during the seven months of the year corresponding to the period during which antitoxin was used. There was laryngeal involvement in 45 cases and tracheotomy was performed in 41 with 11 deaths (26.4 per cent.). In previous years tracheotomy was necessary in 104 cases (23.6 of the cases, with a mortality of 71.4 per cent. (Abstract in the Medical News, August 17, 1895.)

TABLE I.—FATALITY OF CASES OF DIPHTHERIA TREATED WITH ANTITOXIN.

Number of Cases Treated with Antitoxin, the Number and Percentage of Deaths, and the Previous Fatality, in 82 Reports.

REPORTER.	CASES.	DEATHS.	PREVIOUS FATALITY.	REFERENCES.
1. Roux, Martin and Chaillou.		78 (26 per cent.)	50 per cent.	Annales de l'Institut Pasteur, Sept., 1894. (Cases in Hôpital des Enfants-Malades).
2. Kossel.	117	13 (11.1 per cent.)	52–61 per cent.	Deutsche Med. Wochenschrift, 1894, p. 946. (Hospital.)
3. Körte.	121	40 (33.1 per cent.)	45.1 per cent.	Berliner Klin. Wochenschrift, 1894, p. 1039. (Hospital.)
4. Sonnenburg.	95	16 (16.8 per cent.)	27.6 per cent. During period of interruption of serum treatment.	Deutsche Med. Wochenschrift, 1894, p. 930. (Hospital.)
5. Hahn.	205	49 (24 per cent.)	41 per cent.	Ibid, 1895, Vereins-Beilage, p. 2. (Hospital.)
6. Baginsky.	325	83 (15.6 per cent.)	41 per cent.	Die Serumtherapie der Diphtherie. Von Dr. Adolf Baginsky, Berlin, 1895. (Hospital.)
7. Heubner.	365	77 (15 per cent.)	48–52 per cent.	Reported at 13ter Congress für Innere Medicin, München, April 2, 1895. Münchener Med. Wochenschrift, April 9, 1895. (Hospital.)
8. v. Widerhofer.	300	71 (23.7 per cent.)	50 per cent.	Ibid. (Hospital.)
9. v. Ranke.	96	19 (19.7 per cent.)	42.2–56 per cent.	Ibid. (Hospital.)
10. Seifert.	48	12 (25.1 per cent.)	25 per cent.	Ibid. (Hospital.)
11. Baumbach.	100	34 (34 per cent.)	55 per cent.	Ibid. (Hospital.)
12. A. Mendes.	71	4 (5 per cent.)	30 per cent.	Ibid.
13. Knauth.	81	19 (23 per cent.)	45 per cent.	Ibid. (Hospital.)
14. Schröder.	65	8 (12.7 per cent.)	30–57 per cent.	Ibid. (Hospital.)
15. Vierordt.	65	16 (25 per cent.)	41–67 per cent.	Deutsche Med. Wochenschrift, 1895, p. 169. (Hospital.)
16. Bompt.	72	2 (3 per cent.)	13–25 per cent.	Münchener Med. Wochenschrift, Nov. 20, 1894. (Hospital.)
17. Demoulin and Magdelaine.	258	31 (12 per cent.)	50 per cent.	Le Bulletin Médical, 1895, No. 10. (Hôpital des Enfants-Malades.)
18. Le Gendre.	17	3 (17.6 per cent.)	50–60 per cent.	Bull. et Mémoires de la Soc. Méd. des Hôpitaux de Paris, Dec. 20, 1894. (Hôpital Trousseau.)
19. Moizard and Perregaux.	231	34 (14.7 per cent.)	50–60 per cent.	Jour. de Médecine et de Chirurgie, Dec. 15, 1894. (Hôpital Trousseau.)
20. Sevestre and Merklen.	100	45 (45 per cent.)	50–60 per cent.	Le Bulletin Médical, 1895, No. 18. (Hôpital Trousseau.)
21. G. Gottstein.	110	14 (12.7 per cent.)	43.6–78.2 per cent.	Prager Med. Wochenschrift, 1895, Nos. 1, 2 and 3. (Hospital.)
22. S. Haim.	89	13 (14.6 per cent.)	27.2 per cent.	Deutsche Med. Wochenschrift, 1895, No. 4. (Hospital.)
23. Benas.	160	42 (24 per cent.)	53.5–67.5 per cent.	Ibid. 1895, No. 15, and Wiener Med. Presse. 1895, No. 12. (Hospital.)
24. Eschrich.	51	5 (9.5 per cent.)	…	Abstract in Münchener Med. Wochenschrift, 1895, No. 7. (Hospital.)
25. Gundobin.	25	11 (40.7 per cent.)	36–45.5 per cent.	Wiener Klin. Wochenschrift, 1895, No. 1.
26. Monti.	25	1 (4 per cent.)	…	Wiener Med. Wochenschrift, 1895, No. 4 and 5. (Hospital.)
27. Heim.	27	6 (22 per cent.)	52.5 per cent.	Ibid. 1895, No. 4. (Hospital.)
28. Lautenschlager.	31	8 (25.8 per cent.)	66.7 per cent.	Ibid. (Hospital.)
29. Bokelmann.	26	2 (7.7 per cent.)	…	Münchener Med. Wochenschrift, 1894, p. 1062. (Hospital.)
30. Bärensprung.	30	2 (6.66 per cent.)	20 per cent.	Deutsche Med. Wochenschrift, 1894, No. 48. (Hospital.)
31. Beneckt.	11	0	…	Ibid. 1894. Vereins-Beilage, p. 142. (Hospital.)
32. Hager.	25	1 (4 per cent.)	…	Central bl. f. innere Medicin, 1894, No. 48. (Private practice.)
33. Moeller.	76	27 (35.5 per cent.)	…	Ibid. (Hospital.)
34. Kuntzen.	25	3 (12 per cent.)	…	Deutsche Med. Wochenschrift, 1894. No. 49. (Hospital.)
35. Schmidt.	14	3 (21.4 per cent.)	…	Deutsche Med. Wochenschrift, 1894, No. 52. (Private practice.)
36. Sass.	32	1 (3.6 per cent.)	30.6 per cent.	Therapeut. Monatshefte, Dec., 1894. (Private practice.)
37. Charon.	13	4 (30.8 per cent.)	…	Annales de la Soc. Royale des Sciences Médicales et Naturelles de Bruxelles, T. III., p. 357, 1894. (Hospital.)
38. Washbourn, Goodall and Card.	72	14 (19.4 per cent.)	36–41.8 per cent.	Brit. Med. Jour., Dec. 22, 1894. (Hospital.)
39. Virchow.	45	2 (4.4 per cent.)	…	Abst. in Münchener Med. Wochenschrift, 1895, No. 12. (Hospital.)
40. Pavlik.	15	1 (7.7 per cent.)	…	Wiener Med. Presse, 1895, Nos. 1 and 5. (Private practice.)
41. Handler.	32	5 (15.6 per cent.)	…	Ibid, No. 6. (Private practice.)
42. Herringham.	18	3 (16.7 per cent.)	…	Brit. Med. Journ., Dec. 22, 1894. (Hospital.)
43. Caiger.	30	8 (26.6 per cent.)	30 per cent.	Ibid, Dec. 29, 1894. (Hospital.)
44. Ha….	11	3 (27.3 per cent.)	31.25 per cent.	Ibid, Jan. 19, 1895. (Hospital.)
45. Buchanan Williams.	10	1 (10 per cent.)	38 per cent.	The Lancet, Jan. 19, 1895. (Hospital.)
46. Ruffer.	274	37 (13.5 per cent.)	…	Cases treated in four London hospitals. British Med. Jour., Feb. 2, 1895.
47. Epidemic in Trieste. Cases in private practice.	72	5 (6.5 per cent.)	43.8–62.6 per cent.	Das Oesterreichische Sanitätswesen, Jan. 3, 1895.
48. Concetti, in hospital.	180	40 (22.2 per cent.)	…	
49. Baumgarten.	50	2 (4 per cent.)	…	Wiener Klin. Wochenschrift, 1895, No. 3. (Private practice.)
50. Wassermann.	36	5 (14 per cent.)	…	Therapeut. Monatshefte, Feb., 1895.
51. Dreyfus.	78	15 (19.3 per cent.)	50 per cent.	Lyon Médical, Feb. 3, 1895. (Hospital.)
52. Simon.	16	2 (12.5 per cent.)	…	La Médecine Moderne, Feb 6, 1895. (Private practice.)
53. Malvoz.	15	5 (14 per cent.)	…	Le Scalpel, Feb. 17, 1895.
54. Gougenheim.	125	12 (9.5 per cent.)	21.1 per cent.	Annales des Maladies de l'Oreille, du Larynx et du Pharynx, 1895, No. 5. Abst. in the Medical News, June 15, 1895. (Hospital.)
55. Barbier, etc.	100	7 (7 per cent.)	20–30 per cent.	Zeitschrift f. Medizinal-Beamte, Feb. 15, 1895. (Collective investigation of use of antitoxin in private practice in district of Minden.)
56. Schüller.	33	1 (3.1 per cent.)	…	Allgem. Med. Central-Zeitung, 1895, No. 88. (Private practice.)
57. Goldstein.	12	1 (8.3 per cent.)	…	Abst. Schmidt's Jahrbuch, 1895, Bd. 246, p. 37. (Hospital.)
58. Schauwen.	15	0	…	Berliner Klin. Wochenschrift, 1895, No. 10. (Private practice.)
59. Hochsinger.	24	3 (12.5 per cent.)	…	Ibid. (Private practice.)
60. Risel.	114	9 (7.9 per cent.)	…	Deutsche Med. Wochenschrift, 1895, No. 10. (Hospital and private practice.)
61. Weiland.	30	0	…	Ibid. (From private practice of six physicians in Baden.)
62. v. Muralt.	58	2 (3.4 per cent.)	…	Correspondenzbl. f. Schweizer-Aerzte, 1895, No. 5. (Hospital.)
63. Blattner.	35	9 (23.6 per cent.)	…	Abst. in Münchener Med. Wochenschrift, Mar. 5, 1895. (Hospital.)
64. Gerloczy.	55	15 (27.3 per cent.)	…	Abst. Ibid. (Hospital.)
65. D'Espine.	60	6 (10 per cent.)	…	Rev. Méd. de la Suisse Romande, April 20, 1895. (40 cases in hospital.)
66. Mya.	17	2 (11.8 per cent.)	…	Wiener Med. Blätter, 1895, p. 59. (Hospital.)
67. v. Engel.	39	10 (25.5 per cent.)	50 per cent.	Prager Med. Wochenschrift, 1895.
68. Fischer.	225	35 (15.5 per cent.)	…	New York Medical Record, April 6, 1895. (Hospital, consultation and private practice.)
69. Biggs—Cases in the city treated by sanitary inspectors.	255	40 (15.69 per cent.)	25–45 per cent.	Ibid. April 20, 1895.
70. Cases in Willard-Parker Hosp'l.	164	45 (27.4 per cent.)	72 per cent.	
71. Lennox Browne.	83	3 (3.6 per cent.)	34 per cent.	Le Bulletin Médical, 1895, No. 21. (Hospital.)
72. Cold and Whitehouse.	11	4 (36.4 per cent.)	…	British Med. Jour., May 18, 1895. (Hospital.)
73. Winkfield.	22	4 (18.2 per cent.)	36 per cent.	Ibid. May 11, 1895. (Hospital.)
74. Kennedy.	21	1 (4.8 per cent.)	10.7 per cent.	Abst. in Münchener Med. Wochenschrift, May 7, 1895. (Hospital.)
75. Sizel.	100	17 (17 per cent.)	40–50 per cent.	Ibid. May 21, 1895 (abstract). (Hospital.)
76. Howard.	40	3 (7.5 per cent.)	…	The Medical News, June 1, 1895. (Private practice.)
77. Van Nes.	52	15 (29 per cent.)	36–48 per cent.	Deutsche Med. Wochenschrift, June 6, 1895. (Hospital.)
78. Lautenschlager and Wendelstadt.	153	25 (16.3 per cent.)	30.9 per cent.	Münchener Med. Wochenschrift, June 11, 1895. (Hospital.)
79. Kerin.	96	10 (10.3 per cent.)	…	Deutsche Med. Wochenschrift, July 11, 1895. (35 cases—hospital.)
80. Langer.	31	6 (19.4 per cent.)	…	Abst. in Deutsche Medizinal-Zeitung, June 10, 1895. (Hospital.)
81. Cases treated in Cartagena.	156	21 (13.5 per cent.)	…	Abst. in British Med. Jour., July 6, 1895.
82. Mason.	309	81 (26.4 per cent.)	45–52 per cent.	Reported to Assoc. of American Physicians, May 31, 1895. Abst. in the Medical News, June 15, 1895. (Hospital.)
Total 82 Reports.	7100	1239 (17.3 per cent.)		

The fatality of 7100 cases of diphtheria treated with antitoxin was 17.3 per cent. The previous or simultaneous fatality of cases not treated with antitoxin is stated in 46 reports. These … 5000 … cases treated with antitoxin with 1095 deaths, a fatality of 18.6 per cent. Estimating the … fatality … on the basis of the previous or simultaneous fatality for each group (taking the lowest figures given), there would have been 2210 deaths or 42.1 per cent. There was, therefore, an apparent reduction of case mortality by the use of antitoxin of 55.8 per cent.

taneous percentage of deaths from diphtheria not treated with antitoxin is given for the same hospital or locality in which were the cases treated with antitoxin. These reports contain 5406 cases of diphtheria treated with antitoxin, with 1008 deaths or 18.6 per cent. If we calculate the number of deaths in each series of these cases upon the basis of the previous fatality, selecting the lowest percentages given, we have 2279 deaths or 42.1 per cent. There is, therefore, on this estimate by the use of antitoxin an apparent reduction in the number of deaths of 55.8 per cent.

There must be a much greater difference between the characters of the cases composing the two groups compared than appears from the statements of the writers and the details of the cases described, if this striking reduction in fatality is not due to the serum treatment.

If we separate the hospital cases from those in private practice we obtain from 61 reports of Table I 5777 cases of diphtheria treated with antitoxin in hospitals. These furnished 1081 deaths, giving a percentage of 18.7. Although this is not an unheard of fatality of diphtheria in hospitals, it is most exceptional, and I am not aware that anything approaching it has been observed in hospitals receiving large numbers of cases of diphtheria in children. The fourth column in Table I gives the percentages observed in many such hospitals.

There are 41 reports which give for the same hospital the previous percentage of deaths from diphtheria not treated with antitoxin. These furnish 4899 cases treated with antitoxin, with 944 deaths or 19.3 per cent. If we calculate the number of deaths which would have occurred among these cases had the percentages of previous fatality obtained, selecting the lowest percentages given, there would have been 2150 deaths or 43.5 per cent. The apparent diminution in the number of deaths as the result of serum treatment is according to this estimate 55.6 per cent. If we had selected only the larger and most carefully analyzed and satisfactory statistics from the principal hospitals, in large part children's hospitals, there would have been in over 3000 cases an apparent reduction in fatality of 60 per cent.

There may occur considerable differences in the annual fatality from diphtheria in a hospital during a series of years, but such differences between the minimum and the maximum fatality as that just noted between the actual and the estimated fatality are most exceptional. In the Friedrichshain hospital in Berlin there has been observed a difference of 28 per cent. in the annual fatality from diphtheria. The largest difference observed in the surgical clinic in Berlin during ten years was that between 43.2 per cent. in 1888 and 58.5 per cent. in 1890.[*] In the report of the Metropolitan Asylums Board[†] in London, where the case mortality from diphtheria in hospitals is generally much lower than on the Continent, the fatality in 1889 was 40.7 per cent.; in 1890, 33.5 per cent.; in 1891, 30.6 per cent.; in 1892, 29.3 per cent.; in 1893, 30.4 per cent. This apparent reduction in fatality since 1889 in large part disappears if only patients under 15 years of age are

considered, the corresponding percentages for these being respectively 40.7, 41.6, 36.9, 35.6, and 37.

The natural interpretation of our statistics showing in over 7000 cases, of which at least five-sixths are from hospital practice, treated with antitoxin an extraordinarily low percentage of deaths for this class of cases, and showing an apparent reduction in fatality of from 50 to 60 per cent. by the use of antitoxin, is that antitoxin exerts a specific curative power over diphtheria.

What are the objections which may be and have been urged against this natural interpretation of the statistical evidence? In the first place it has been claimed that these observations have been made during the prevalence of unusually mild diphtheria. In some places the prevailing type of the disease seems to have been mild, but the great majority of the observers quoted in the table consider that the prevailing diphtheria in their localities has been of average severity, and they cite in many instances the simultaneous fatality of cases not treated with antitoxin as proof that the disease is not of peculiarly mild type, indeed in several places it seems to have been of more than average severity. During the period in which Roux treated with antitoxin 300 cases in the Hôpital des Enfants-Malades with a fatality of 26 per cent., the fatality in the Hôpital Trousseau, also in Paris, and receiving a similar class of cases, was 60 per cent.

But even if it be admitted for the sake of argument that the prevailing type of diphtheria during the past year has been mild, it is to be considered that the influence of this milder type upon the cases received in many hospitals appears chiefly in the reduction of their number, and far less in a change in the character of the cases admitted. This is the statement of von Ranke, of Bokai and of several other physicians in charge of diphtheria wards. They say that so far as their hospitals are concerned, as a rule, severe and advanced cases are sent there by physicians in the city, often for operation to relieve laryngeal stenosis, and that when the epidemic is mild in character they receive fewer cases, but not many milder cases. Doubtless these conditions will not hold for all hospitals, particularly not for such as are intended for the compulsory isolation of all cases of diphtheria which cannot be properly isolated at their homes, but they are probably applicable in large part to most of the hospitals from which come the reports now under consideration.

So far as I can judge, no proof has been brought forward in support of the opinion that the low percentage of fatality of diphtheria treated with antitoxin can be referred in any large measure to the prevalence of an unusually mild type of the disease, although in a few scattered groups of cases, particularly some of the smaller series in my table, this may be in part the explanation.

I am confined to adduce doubtedly some weight to a second criticism of antitoxin, one which is this is to show most probably, that in hospitals a less severe treatment has been conducted out. A proportionately larger number of cases are received now than formerly in the earlier stages of diphtheria. The advocates of the treatment have properly insisted upon the importance of early injection of the serum, and, especially during the time when the serum was not to and exerted in the

* V. Hirsch. Archiv f. klin. Chirurgie, Bd. 49, Hft. 4.
† British Medical Journal, Dec. 22, 1894.

hands of general practitioners, it would be natural to suppose that physicians would send their patients and parents take their children to such hospitals as soon as possible after recognition of the disease. Inasmuch as with any approved method of treatment of diphtheria the results are better the earlier it is begun, it is evident that statistics based on the former experience with the treatment of diphtheria in hospitals would not be altogether comparable with the antitoxin statistics from the same hospitals.

It is, however, very difficult to say how much allowance is to be made for this criticism. There has been wide-spread skepticism among physicians and the general public as to the value of the treatment. Thus Rapmund, in his efforts to establish in the district of Minden a collective investigation of serum therapy in diphtheria, found the physicians so skeptical that of 194 practitioners only 20 would use it at all, and only two employed it extensively. There are also statements as to the unwillingness of parents to have it tried on their children. Many of the reports state that during the period of serum treatment cases were not received in any earlier stages of the disease than formerly; in a few of the reports, as for example in that of Kuntzen from Oschersleben, it is said that physicians were induced to send their patients early in the disease. In Berlin and some other cities there has been a marked increase in the number of patients with diphtheria admitted to hospitals since the introduction of the antitoxin treatment, and this has been without a corresponding increase in the total number of cases in the cities. Heubner in his recent address at the Congress of Internal Medicine in Munich admits that lighter cases of diphtheria go to the hospital now, but that this is not enough to explain the great difference in fatality. There are undoubtedly considerable differences in different hospitals as to the proportion of cases admitted in early stages of diphtheria, but in many of the hospitals where the benefits of antitoxin have been most apparent as contrasted with the previous results it is expressly stated that the number of mild cases admitted is no greater than formerly.

If we make all due allowance for this possible increase in the proportion of early cases treated in hospitals, and certainly some allowance must be made, this factor is still altogether inadequate to explain the great reduction in fatality of diphtheria treated with antitoxin. This will also be apparent later when we consider the results of treatment according to the day of the disease on which it is begun.

A third criticism, namely, that the bacteriological control of the diagnosis of diphtheria operates in favor of a low mortality in antitoxin statistics, has already been fully discussed.

It is manifestly improper to compare the average fatality of thousands of cases treated in hospitals with antitoxin with exceptionally favorable results at certain periods in a few hospitals in a comparatively small number of cases without serum treatment, and still more improper, as has even been done, to make such comparison with the most favorable percentages which one can find reported from private practice or in municipal mortality statistics. Surely some consideration must be given to the previous and simultaneous results obtained from cases without serum treatment in the same hospitals from which the cases reported are derived.

We have now considered the principal objections which have been made to the natural interpretation of statistics showing an apparently great reduction in the fatality of diphtheria by the use of antitoxin. I believe that it has been shown that even if all possible allowance be made for such assumptions as those considered, they are still wholly inadequate to account for an apparent reduction in the deaths from diphtheria by antitoxic treatment of 50 to 60 per cent. in nearly 5000 cases collected from hospitals in Germany, France, Austria, Italy, England and America, and reported by forty different physicians, most of whom are of high reputation and large experience. These statistics seem to me to establish beyond all reasonable doubt the conclusion that antitoxin is a specific curative agent for diphtheria.

It has been contended that the only absolutely convincing proof of the curative efficacy of antitoxin is the demonstration of a marked reduction in the total number of deaths from diphtheria in a city or town in proportion to all of the cases. Municipal mortality and morbidity statistics are necessarily far less accurate than hospital statistics, and for reasons which have been stated, the prevalence of a mild type of diphtheria will have greater influence upon municipal mortality statistics for diphtheria than upon hospital statistics. It is to be expected that when sufficient time has elapsed and the employment of antitoxin in the treatment of diphtheria has become sufficiently general, the reduction in fatality by its use will be apparent in general fatality statistics. At present we have little information upon this point. The mere statement of the total number of deaths, without knowledge of the morbidity and of the prevailing type of disease, is of course not decisive for either side of the question, but so far as it goes it is interesting to learn that in Boston during the antitoxin period (January 1 to May 1, 1895) the total fatality from diphtheria was 14 per cent., as compared with a fatality of 31 per cent. during the corresponding period of previous years (Mason), and that in Cartagena, Spain, during four months of employment of antitoxin, the total number of deaths was only one quarter the average number for the same period of time during the preceding ten years.

The only antitoxin statistics which I can find based upon such material as composes municipal fatality statistics are those of Risel and of Kurth.

Risel reports the results in all of the cases treated by antitoxin during two months in the city of Halle. They are derived from the practice of thirty physicians among the poor and the rich, in the houses of the patients and in hospitals, and include mild and severe cases as they presented themselves. Of the 89 patients treated in their homes, almost without exception children not over 7 years of age, 6 died, giving a fatality of 6.7 per cent. 19 of these had laryngeal diphtheria, of whom 4 died. Of the 25 patients treated in hospitals, 3 died, a fatality of 12 per cent. 15 of these had laryngeal involvement, of whom 3 died. The total fatality was 7.9 per cent. No data are given for comparison with the previous or simultaneous fatality of cases not treated with serum. In only a few cases, and these in hospitals,

was the clinical diagnosis confirmed by bacteriological examination.

Kurth reports the results of serum treatment in the practice of sixty physicians in Bremen and a few outlying villages from October 8, 1894, to January 31, 1895. A circular letter was sent from the Bacteriological Institute to every physician in the city, and apparently general co-operation on the part of the physicians and the public officials was secured. In 97 cases treated with serum the diagnosis of diphtheria was established, in the great majority of cases by demonstration of the Löffler bacillus controlling the previous clinical diagnosis. The total case mortality was 10.3 per cent. The fatality of the 64 cases treated in the city (hospital and private practice) was 7.8 per cent.; that of 33 cases derived from the surrounding country district was 15.2 per cent.; that of 35 cases treated in the city hospitals was 14.3 per cent. Laryngeal diphtheria occurred in 66 per cent. of the cases in country districts and only in 36 per cent. of the cases in the city. This and the generally less favorable results in country practice are attributed by Kurth not to greater severity of the epidemic in the former, but to the custom in the country of not calling the physician until the symptoms are urgent, and to the greater distance which the physicians have to travel. If the bacteriological control of the diagnosis be disregarded, that is, if all the cases diagnosed clinically as diphtheria and treated with serum be considered, the fatality was 9.4 per cent., another illustration that bacteriological control of the clinical diagnosis results in higher, not as some have claimed in lower, percentage of deaths. Of the 50 cases of clinical diphtheria, all of the cases being included which did not show Löffler bacilli, the fatality was only 6 per cent. During the serum period there occurred 25 cases of diphtheria not treated with antitoxin, with a fatality of 24 per cent. During the same period of the year in which the serum-treated cases occurred, there were during the preceding year 148 cases of diphtheria with a fatality of 32 per cent. It must be conceded that these interesting reports of Risel and of Kurth speak strongly in favor of the possibility of bringing about a great reduction in the general fatality from diphtheria in cities by treatment with antitoxin. As a larger proportion of the cases in private practice can be treated in early stages of the disease than in the hospitals, this reduction should be greater than that already shown by hospital statistics.

A most convincing demonstration of the healing power of antitoxin is furnished by the experience of Baginsky during an involuntary pause in the serum treatment caused by failure in the supply of serum. Between March 15, 1894, and March 15, 1895, there were treated in Baginsky's service by antitoxin 525 children with a fatality of 15.6 per cent. During the period of forced interruption of the serum treatment, this period being chiefly the months of August and September, 126 children were treated without antitoxin, with a fatality of 48.4 per cent. There was absolutely no selection of cases in either group. In his comments upon this experience Baginsky says: "It is all the more remarkable, as the ratio of mortality of those treated with the serum both before and after the period of interruption varied within very small percentage figures. If one will permit figures to speak at all,

there has scarcely been made on human beings a more demonstrative test of the curative power of a therapeutic agent. It was an experiment forced upon us, but it proved to us how terrible was the form of disease which we were treating, and how numerous would have been the victims without the use of the healing serum."

A similar experience has been reported by several other writers. Thus Körte noted a rise in fatality from 33.1 per cent. during the serum period to 53.8 during the period of failure in the supply of serum. Ganghofner, under similar conditions, a rise from 12.7 per cent. to 53.2 per cent.; Heim, from 22 per cent. to 65.6 per cent., and during the epidemic in Trieste the fatality rose from 18.7 per cent. to 50 per cent. when the serum failed. All of these highly significant observations were made on cases occurring in the same epidemic, the period of enforced interruption of the serum treatment being preceded and followed by the periods of serum treatment.

We have considered thus far mainly the hospital statistics. These are for manifest reasons more numerous, larger and more carefully analyzed than those from private practice. It is, however, in private practice, especially among those classes who are in the habit of calling the physician early in the disease, that the best results from serum treatment are to be expected, for here there is more frequent opportunity for timely treatment. A glance at Table I will show that in general the fatality of diphtheria treated with serum in private practice is much lower than in hospitals.

If we summarize the 18 reports from private practice in Table I we have 663 cases of this class treated with antitoxin, and among these are 46 deaths, giving a fatality percentage of only 6.9. This would indicate that the serum treament may reduce the fatality from diphtheria in private practice to nearly one-third that under the same treatment in hospitals. Some of the reports of the results of serum treatment in private practice furnish, indeed, most remarkable evidence of the efficacy of this treatment.

Most of the reports attempt some sort of classification of the cases treated with antitoxin. The simplest and most common, although not the most valuable, is the division according to degrees of apparent severity, expressed by such epithets as mild, moderate, severe, very severe. Such a classification is, of course, only of limited value, as even the mildest case of diphtheria may unexpectedly assume a malignant character. If, as we believe to be proven, antitoxin in time arrests the local process and the constitutional disturbance, then many of the cases which appear under the head of mild cases in antitoxin statistics would under other methods of treatment have become severe cases and would be so recorded. Indeed, with the early administration of antitoxin there should be comparatively few severe cases.

The classification of diphtheria adopted by Roux into angina and croup, with and without microbic association, has been followed by some of his successors. So far as this classification is actually based upon a careful separation of pure diphtheria from diphtheria with mixed infection, it is of the utmost importance in determining the relative value of antitoxin in the treatment of these two divisions of diphtheria.

I have already expressed the opinion, however, that the bacteriological examination of the exudate and secretions in the throat is not decisive in determining the presence or absence of mixed infection. Still Roux's analysis of his cases on this basis indicated clearly that the serum was far more efficacious in diphtheric anginas and croup which yielded pure cultures of the Löffler bacillus than in those which gave, in addition to the Löffler bacillus, cultures of other pathogenic bacteria. In presenting these results the epithet "pure" applied to angina or croup is to be understood to signify that only the Löffler bacillus was found in the cultures, and the epithet "associated" to signify that this bacillus was found in cultural association with the coccus of Brisou, staphylococci or streptococci, most commonly the last. The "corrected" percentages are those obtained after subtracting deaths occurring within twenty-four hours after admission.

Of the 300 cases treated with serum with a total fatality of 26 per cent. reported by Roux, Martin and Chaillou, there were 120 pure anginas, fatality 7.5 per cent. (corrected 1.7 per cent.); 49 associated anginas, fatality 24.2 per cent. (corrected 17.7 per cent.); of not operated croup, 4 pure, fatality 0, 6 associated, fatality 16.6 per cent.; of operated croup, 49 pure, fatality 30.9 per cent. (corrected 24.4 per cent.), and 72 associated, fatality 56.9 per cent. (corrected 43.1 per cent.).

Of Moizard and Perregaux's 231 cases, total fatality 14.7 per cent., there were 44 pure anginas, fatality 4.5 per cent.; 42 associated anginas, fatality 14.3 per cent.; 94 pure croup, fatality 18.5 per cent.; 51 associated croup, fatality 17.6 per cent. No correction is made in these percentages.

Of Sevestre and Meslay's 150 cases, total fatality 10 per cent., there were 29 pure anginas, fatality 3.4 per cent.; 24 associated anginas, fatality 12.5 per cent. (corrected 8.3 per cent.); 67 pure croup, fatality 8.9 per cent. (corrected 7.5 per cent.); 30 associated croup, fatality 16.6 per cent. (corrected 6.6 per cent.).

It will be observed that in the last two reports the excess in fatality in the "associated" diphtherias is much less striking than in Roux's statistics, and in some cases disappears altogether. This I am inclined to attribute to failure of the method employed to indicate properly the division into pure and mixed infections, for the testimony is unanimous that the serum is of far less benefit in mixed diphtheria than in uncomplicated diphtheria, the most common and dangerous complicating micro-organism being the streptococcus pyogenes.

Most noteworthy has been the improvement in the results of serum therapy of diphtheria in the Paris hospitals since Roux's original communication to the Congress in Budapest in September, 1894. The fatality has descended from Roux's original percentage of 26, in the later reports to 14.7, 12 and 10 per cent., and according to a recent statement of Moizard and Bouchard (July, 1895), it at present oscillates between 8 and 14 per cent. These are the best results which have hitherto been reported from any hospital for any large number of cases, and they are certainly most significant. As Moizard and Bouchard in their recent communication say, "This result can no longer be attributed to fortunate series of cases, as was claimed at the beginning by adversaries of the method. Thousands of patients have been treated, and it can now be said that the controversy is closed." This striking descent from Roux's first figures is not, however, attributed by the writers wholly to improvements in the methods of serum therapy. As Roux pointed out in his first paper, the hygienic conditions in the two Paris hospitals from which these statistics come were very bad. These conditions have since then been greatly improved, and this reform has been especially manifest in the reduction of the deaths from broncho-pneumonia.

A most important classification of diphtheria for estimating the curative value of antitoxic serum is that into cases without and with laryngeal stenosis, and especially when such degrees of stenosis are considered as require operative interference by tracheotomy or intubation. I have therefore prepared the following table (Table II) which gives the results of antitoxin treatment in operated and not operated cases of diphtheria. This of course is not equivalent to a division into anginas and croup, as many cases of croup are included in the non-operated cases, but I have desired to submit the new method of treatment to the most severe test. No one can claim that laryngeal diphtheria requiring intubation or tracheotomy is anything but a severe disease. If the benefits of antitoxin are unmistakably manifested in these operated cases of croup, then the test is an *experimentum crucis* and puts an end to the objections of those who assert that the apparently favorable results of serum therapy in diphtheria are attributable mainly to the large proportion of mild cases treated.

The same reports with a few additional ones, for which references are given, have been used for Table II as for Table I, but many of the reports in Table I were not available for this table, as the writers did not always present their results in a form which fitted into the classification adopted. The table gives for each report the total number and fatality of cases treated, as in Table I, the number and fatality of cases not operated on (including cases of croup), the number and fatality of cases operated on, "T" signifying tracheotomy, "I" intubation, "I and T" signifying intubation followed by tracheotomy, and, so far as reported, the previous or simultaneous percentage of fatality from operation in cases not treated with antitoxin. In the final column are pertinent statements concerning cases in the series. Some reports are inserted which do not give the number of cases under the different headings. These, of course, cannot be used in the summary giving the totals.

Of the 4294 cases in Table II, 27.2 per cent. required tracheotomy or intubation. There were, however, many more cases of laryngeal diphtheria in this group than the ratio of operative cases would indicate, for it is the testimony of the great majority of the observers that the stenotic symptoms of laryngo-tracheal diphtheria are relieved without the necessity of operation in a much larger proportion of the cases treated with antitoxin than by any other method of treatment. As is well known, recovery without intubation or tracheotomy from descending laryngo-tracheal diphtheria, especially in children, is exceptional under all other methods of treatment, and the greater relative frequency with which such recovery occurs under serum treatment is a strong proof of the efficacy of antitoxin.

TABLE II.—FATALITY IN OPERATED AND NON-OPERATED CASES OF DIPHTHERIA TREATED WITH ANTITOXIN.

T Signifies Tracheotomy, *I* Intubation, *I* and *T* Intubation followed by Tracheotomy.

Reporter.	Total Cases.	Deaths.	Not Operated Cases.	Deaths.	Operated Cases.	Deaths.	Previous Fatality from Operation.	Remarks.
Berl. Woch. and l. Ciniche.				22 (12.8 per cent.)	121 T	56 (40 per cent.)	67 per cent.	Deducting those which died in less than 24 hours after admission to the hospital, there remain 107 tracheotomies with 4 deaths (39.2 per cent.). In all of the fatal operations it was necessary to perform tracheotomy within 12 hours after admission.
				1 (4 per cent.)	28 T	12 (42.8 per cent.)	....	Of 8 tracheotomized cases under 2 years of age, 5 died (62.5 per cent.). The previous fatality for tracheotomy under 2 years was 90.7 per cent.
				5 (7.8 per cent.)	42 T	22 (52.4 per cent.)	77.5 per cent.	
				8 (13.1 per cent.)	34 T	8 (23.5 per cent.)	38 per cent.	The fatality of 38 per cent., in the table is that of 45 tracheotomies performed during the period in which the supply of antitoxin (temporarily) was exhausted and could not be at once replaced.
				6 (12.5 per cent.)	45 (38.7), 34 I, 11 I & T. In 11 cases tracheotomy followed intubation.	35 (38.8 per cent.) In the secondary tracheotomies died, 62.2 per cent.	62.4 per cent., 44 per cent., I	During two months in which the supply of serum failed the general fatality rose to 48.4 per cent, and that from tracheotomy and intubation to 62.2 per cent. The fatality at once fell upon re-introduction of the anti-toxin treatment.
				29 (40.3 per cent.)	92 I, 36 I, 34 I	71 (55.2 per cent.)	45.7 per cent.	22 cases of laryngeal diphtheria (croup) recovered without operation.
				4 (14 per cent.), 3 (9 per cent.), 1 (6 per cent.)		12 (43 per cent.), 3 (6 per cent.)	42.7 per cent., 19 per cent.	21 cases of croup recovered without operation.

TABLE II.—FATALITY IN OPERATED AND NON-OPERATED CASES OF DIPHTHERIA TREATED WITH ANTITOXIN.

T Signifies Tracheotomy, I Intubation, I and T Intubation followed by Tracheotomy.

Reporter.	Total Cases.	Deaths.	Not Operated Cases.	Deaths.	Operated Cases.	Deaths.	Previous Fatality from Operation.	Remarks
Hoas, Martin and Chaillou	300	78 (26 per cent.)	179	22 (12.8 per cent.)	121 T	56 (46 per cent.)	67 per cent.	Deducting those which died in less than 24 hours after admission to the hospital, there remain 39 tracheotomies with 14 deaths, 35.2 per cent. Had all the intubation cases been subjected to tracheotomy with 12 hours after admission … Of 9 tracheotomized cases under 2 years of age, 5 died, 62 per cent. The fatality among children under 2 years was 36.7 per cent. The fatality of 38 per cent., in the table, is that of 15 …
Kossel	115	13 (11.1 per cent.)	94	1 (1.1 per cent.)	23 T	12 (52.2 per cent.)	…	
Klebs	121	40 (33.1 per cent.)	79	18 (22.8 per cent.)	42 T	22 (52.4 per cent.)	77.5 per cent.	Of 9 tracheotomized cases under 2 years of age, 5 died, 62 per cent.
Sonnenburg	95	16 (16.8 per cent.)	61	8 (13.1 per cent.)	34 T	8 (23.5 per cent.)	38 per cent.	The fatality of 38 per cent., in the table, is that of 15 tracheotomies performed …
Baginsky	525	83 (15.8 per cent.)	430	47 (10.9 per cent.)	95 (53 T, 42 I)	36 (34.7 per cent.)	64.1 per cent. T / 46.8 per cent. I	Of the secondary tracheotomy cases (intubation followed by tracheotomy) 36.2 per cent. died …
v. Widerhofer	340	71 (23.7 per cent.)	232	50 (10.1 per cent.)	82 I	61 (47.3 per cent.)	…	22 cases of laryngeal diphtheria (croup) recovered without operation. 21 cases of croup recovered without operation.
v. Ranke, Smirakina, Schmitt, Vierordt	86 / 98 / 54 / 64	19 / 11 / 8 / 16	54 / 55 / 30 / 44	6 / 4 / 5 / 9	32 I / 42 I / 24 I / 15 T	13 / 7 / 3 / 7	41.77 per cent. I / 40 per cent.	Deducting 6 cases in a hopeless condition on admission …
Rumpf, Delavan and Magdelaine	250 / 298	8 / 81	15 / 180	0 / 8	7 T / 75 (54 I)	4 / 23	13.2 per cent. T	Of the intubated cases 7 died in less than 24 hours after admission. Deducting these, the fatality from intubation was only 16 per cent.
Legroux, Monard & Perregaux / Sevestre and Meslay	298	22 (14.1 per cent.)	234	23 (9.6 per cent.)	64 (51 T, 10 I & T)	29	86 per cent.	The total fatality is reduced to 8.7 per cent. These cases are those treated in the Hospital Trousseau in Paris in 1894 …
Ganghofner	110	14 (12.7 per cent.)	66	8 (12 per cent.)	44 I or T	6	59.8 per cent.	Laryngeal diphtheria recovered without operation. During the period in which the supply of serum failed the general fatality rose to 33.2 per cent, and that of operated cases to 66.6 per cent.
Soltmann, Bokai	89 / 129	13 / 31	48 / 115	2 / 16	41 I / 10 I	11 / 21	68 per cent. / 70 per cent.	In 12 cases presenting symptoms of moderate laryngeal stenosis upon admission, these symptoms disappeared after injection of antitoxin without operation.
Heim	57	6 (22 per cent.)	21	4	6 (2 T, 4 I)	2	…	During the period when the supply of serum failed the general fatality rose to 65.6 per cent. Heim treated altogether 48 cases in two groups, but of 31 in the 2d group of 31 …
Börger	30	2 (6.66 per cent.)	25	1	5 T	1	…	In 13 previous series of tracheotomies in each group the fatality is given … The 7 operated cases were mild.
Mueller, Kundrat, Churon, Washbourn, Goodall and Kanthack, Herringham	15 / 28 / 15 / 18	5 / 10 / 1 / 3	25 / 28 / 15 / 7	8 / 1 / 11	68 T / 21 T / 5 T / 11 (10 T, 1 I)	19 / 4 / 3	55.6 per cent. / 91.7 per cent. / 75 per cent. T	During a period of exhaustion of the supply of serum the general fatality rose to 50 per cent. These data are from abstracts …
Germain— (Univ. Hospital of Trieste)	224	42 (18.7 per cent.)	178	18 (10 per cent.)	46 (1 T, 45 I)	24 (54.5 per cent.)	85.5 per cent. T / 75 per cent. I	The general serum fatality is variously given as 38.7 per cent., 30.1 per cent. and 20 per cent. …
Witthauer, Bagmund	36 / 100	4 / 12	16 / 88	1 / 7	20 T / 12 T	4 / 5	25 per cent.	Collection of cases treated in private practice by several physicians in Minden.
Hogenhuin, Bisei, v. Muralt	60 / 114 / 58	3 / 9 / 7	28 / 93 / 38	2 / 5 / 3	32 T / 19 T / 20 (4 I and 7 T)	1 / 6 / 4	…	After intubation (I) 1 death, after intubation and tracheotomy 1 death, after tracheotomy 1 death.
D'Espine, v. Engel	60 / 30	6 / 10	19 / 20	2 / 4	41 / 7 T	4 / 3	85 per cent.	9 cases of group recovered without operation. 28 per cent. (in 13 cases).
Cobb & Whitehouse	11	4 (36.4 per cent.)	7	1	4 T	2	…	60.5 per cent. / 48.75 per cent.	3 of the 4 deaths were from croup.
Winkheld, Sigel	123	25 (20.3 per cent.)	86	9 (10.4 per cent.)	37 T	16 (43.2 per cent.)	64 per cent.	The fatality of tracheotomized cases in 1891 up to the first serum injection was 4 to 5 times as great …
Galatti	No. of cases not given.	…	No. of cases not given.	…	3 T	3 (100 per cent.)	65.5 per cent. / 63.3 per cent. / 50 per cent. T	…
Kraske	…	…	…	…	15 I	6	52.6 per cent. I	Says that he has tracheotomized 72 cases and treated with antitoxin …
Boman, Van Ness	Not given. / 52	12 (23 per cent.)	30	4 (13.3 per cent.)	5 I / 16 T	2 / 9	29 per cent. (in 12 cases).	…
Leichtenstern and Wendelstadt	123	…	86	…	37 T	…	60.5 per cent. / 48.75 per cent.	…
Krohs, Timmer, Masohi	28 / 31 / 365	Not given. / 6 / 83	Not given. 20 / 275	… / 5 / 7	No. of cases not given.	…	61 per cent.	Collection of tracheotomized cases less than 2 years old, 4 died, between 1 and 4 years 4 out of 11 died …
Kurth	97	10 (10.3 per cent.)	82	7 (8.5 per cent.)	15 T	3 (20 per cent.)	80 per cent.	Of 25 cases of laryngeal diphtheria not operated upon, 20 recovered.
Total of 38 Reports.	**4294**	**784 (18.3 per cent.)**	**3157**	**360 (11.4 per cent.)**	**1167**	**431 (37.2 per cent.)**		

In 41 reports there are 648 tracheotomies with 258 deaths, a fatality of 39.8 per cent., 312 intubations with 99 deaths, a fatality of 39.5 per cent., and 26 intubations followed by tracheotomy with 14 deaths, a fatality of 53.8 per cent.

There are 211 operated cases in which it is not stated how many are tracheotomy or intubation. These gave a fatality of 40.2 per cent. They were probably for the most part tracheotomies.

The reports giving the previous or simultaneous fatality from tracheotomy contain 510 cases of tracheotomy with 217 deaths or 42.5 per cent. If the fatality of these cases be reckoned on the basis of the preceding or simultaneous fatality, selecting the lowest figures given, there would have been 329 deaths or 64.5 per cent. There was, therefore, an apparent reduction in fatality of 34.1 by the serum treatment.

Making a similar estimate on the basis of previous fatality from intubation, there were 250 intubations with 79 deaths or 31.6 per cent, instead of 116 deaths or 43.5 per cent, as the result of serum treatment.

There was, therefore, an apparent reduction in the fatality of intubated cases of 40.5 per cent, as the result of serum treatment.

The fatality of 3157 non operated cases was only 11.4 per cent.

Of Kossel's 44 cases of laryngeal diphtheria treated with antitoxin, 21 (47.7 per cent.) recovered without operation ; of von Widerhofer's 130 stenotic cases treated with serum 22 (16.9 per cent.) recovered without operation; of von Ranke's 63 cases, 21 (33.3 per cent.); of Vierordt's 24 cases, 9 (37.5 per cent.); of Ganghofner's 56 cases, 12 (21.4 per cent.); of Bokai's 63 cases, 14 (22.2 per cent.); of d'Espine's 21 cases, 10 (47.6 per cent.). Von Ranke says that before the use of serum at most 5 per cent. of his cases of laryngeal stenosis escaped operation, whereas now 33 per cent. escape. Of Ganghofner's stenotic cases formerly 12 per cent. escaped operation, whereas now 21 per cent. escape. The experience of Heubner and many others is similar.

In this respect, as in so many others, the results in the Paris hospitals have been most favorable. Of Moizard and Perregaux's 145 cases of croup, 90 (62.1 per cent.) recovered without intubation or tracheotomy. Roux, Martin and Chaillou say, " Of 169 children, admitted to the service for diphtheric angina, 56 presented laryngeal symptoms ; 31 had hoarse voice, and in 25 the voice was so far extinguished and the dyspnœa (tirage) so marked that one might believe that the latter patients should be operated on. Under the influence of the serum (and in these cases one should not fear to make an injection every twelve hours), the dyspnœa diminished, then occurred only paroxysmally, the child coughed up false membranes, and at the end of two or three days the respiration became normal, to the great astonishment of the interns and personnel of the pavilion who, with their large experience of children affected with croup, indeed thought that operation could not be avoided. To-day in the presence of a child with dyspnœa it is not necessary to press for operation. One can inject the serum and wait as long as possible. Since the introduction of the serum the number of tracheotomies in the pavilion has diminished."

Out of his large experience Baginsky expresses himself in these vigorous words: " Here again the observation of the individual cases of laryngeal stenosis, and more especially of those which do not come to the point of operation, speak to me more forcibly than the statistical figures. The surprising regression of the laryngo-stenotic respiratory phenomena, the freedom of breathing, the disappearance of the hoarse voice and the croupy cough, the euphoria of the children, the change in their general condition so that two days after the injection they are sitting up in bed, playing and contented and observant of their surroundings ; all of these things produce in him who has had before his eyes for years the hopeless picture of continually progressing laryngeal stenosis, in very truth ineffaceable impressions."

Experience based upon such a large number of cases and careful clinical observation must be regarded as representing the norm. That there may be deviations from this norm, even in a fair number of cases, seems to be illustrated by the experience of Leichtenstern and Wendelstadt, who in 123 cases of diphtheria, with 37 tracheotomies, were not able to note any material reduction in the proportion of cases requiring tracheotomy as compared with former series of cases. Their observations were uncontrolled by bacteriological diagnoses.

Another point to be considered in this connection is of capital importance as an indication of the value of serum treatment. Cases which are free from symptoms of laryngeal involvement at the time of injection of the serum do not develop such symptoms later, or do so only very exceptionally, unless evidences of such involvement appear within twenty-four hours after the injection.

Regarding neither this nor any other point is there entire unanimity of opinion in the various reports, nor is such to be expected from observers of limited numbers of cases with unequal distribution in the various groups of mild cases, of early cases, of anginas, of croup, of pure diphtheria, of septic diphtheria, etc., to say nothing of the absence in some reports of any bacteriological control of the diagnosis and of treatment by insufficient doses or inferior quality of serum. I am only surprised that the conflicting statements are not more numerous. But there are not many points concerning which there are so few differences of statement as concerning the efficacy of antitoxin in preventing descent of the diphtheritic process to the larynx and the trachea. Over and again one can read in the reports such statements as that in all of the patients who entered without laryngeal diphtheria, the larynx remained free, or that unless the symptoms of stenosis appeared within the first twenty-four hours after injection of the serum, they were not observed at all or only most exceptionally. Among the many vouchers for these statements may be cited Kossel, Roux, Baginsky, von Widerhofer, Heubner, von Ranke, Vierordt, Ganghofner, Escherich, Bokai, Van Nes, Kurth.

It is this power of antitoxin to check the spread of the diphtheritic process from the tonsils and pharynx into the larynx, and from the larynx into the bronchi, which has impressed many observers in favor of the new treatment more forcibly than any other feature of their experience with its action. Thus Vierordt observed that of 24 children with diphtheria who were admitted with unaffected larynx and treated with antitoxin, only one developed temporarily a hoarse cough on the third day. In all of the others the larynx remained free. Of 23 patients who were admitted with unaffected larynx not long before the introduction of the serum treatment, nine afterward developed croup. This is doubtless a somewhat unusual experience as regards the large proportion of cases of croup developing under previous methods of treatment.

It follows from what has been said that the ratio of operative cases in antitoxin statistics will in general be smaller than in statistics of cases of the same character treated by other methods. On the one hand there will be fewer laryngeal stenoses developing after commencement of the treatment, and on the other hand a larger number of recoveries from advanced diphtheria without the necessity of operation. The difference appears even to illustrate this point on the service from which one case reported as Bokai's service tracheotomy was performed before the serum period in 50 per cent. of the cases of diphtheria, after the introduction of serum in 40 per cent. The later Paris reports give a much greater reduction in the ratio of tracheotomies. In Baginsky's service, one-tenth of the cases free from tracheotomy rather less

of serum, and 18.1 per cent. after its introduction; in von Ranke's service the corresponding figures are 57 per cent. before and 43.5 per cent. after; in Bokai's 65.6 per cent. before and 40.8 per cent. after. As already mentioned, Leichtenstern's figures, 32 per cent. before and 30 per cent. after serum, are exceptional.

It is furthermore to be considered that in view of the power of antitoxin to abate beginning and moderate symptoms of stenosis, operation will be delayed rather than hastened, and, when performed, the indications for it will generally be urgent. For manifest reasons, most of the operations will fall within a period not remote from the time of injection of the serum. Of the 121 tracheotomies in the report of Roux, Martin and Chaillou, 102 were performed either before the first injection of antitoxin or within 12 hours afterward; 14 between the 12th and the 36th hour after inception of the serum treatment, and only 5 later than 36 hours after the injection of the serum. Of the 23 tracheotomies with 12 deaths reported by Kossel, the operation was performed within the first twelve hours in all of the fatal cases, and of the 11 successful cases it was performed in 9 on the day of admission to the hospital, in 1 on the second day and in 1 on the following day. Kossel refers the increase in the stenotic symptoms after injection of the serum in the two last cases to the separation of the false membranes, a point to which others have also called attention as an effect of antitoxin and which is to be borne in mind in cases of croup treated by antitoxin.

Turning now to the results of tracheotomy and intubation in cases treated with antitoxin, we find in Table II that in 41 reports there were 648 tracheotomies with 258 deaths, a fatality of 39.8 per cent., and 342 intubations with 99 deaths, a fatality of 28.9 per cent., and 26 intubations followed by tracheotomy with 14 deaths, a fatality of 53.8 per cent. These are not unheard of fatalities from these operations, but they are so low as to indicate decidedly remedial action of antitoxin.

The percentage of fatality from tracheotomy in diphtheria given by Monti from a total of 12,736 cases up to 1887 is 73.3. The percentage given by V. Hirsch in 1654 tracheotomies in diphtheria, in von Bergmann's clinic in Berlin during the last ten years and seven months (up to July 31, 1894), is 68.7, the fatality during the first four years of this period being 70.5 per cent., and during the last four years 63.8 per cent. The fatality during the first year of life was 98.8 per cent. and sank for each year to the ninth, when it was 41.7, and after the tenth year it rose again.

More proper, however, than comparison with these latter percentages is comparison with the percentages of fatality in the same hospital or place from which the respective groups of cases are reported. It will be observed that with one exception in the table the percentage of deaths following operation in cases treated by antitoxin is lower, and generally very much lower, than the previous or simultaneous fatality. Kraske's exceptional series is of so few cases (only 5 with and 12 without serum) as to be without any significance. The lowest fatality thus far reported in a series is 3 deaths in 31 tracheotomies with serum treatment, or a fatality of only 9.6?

per cent. This is reported by Schroeder from the hospital in Altona.

If for each group of cases we estimate the number of deaths which would have occurred in the tracheotomized cases treated with serum on the assumption that the previous or simultaneous fatality in cases not treated with serum had obtained, we obtain the following result: The actual percentage of deaths in 510 tracheotomized cases treated with serum was 42.5. The percentage of fatality in these cases estimated on the basis of previous or simultaneous fatality in the same hospitals would be 64.5. There was therefore an apparent reduction in fatality by the serum treatment of 34.1 per cent. This difference between actual and estimated fatality is greater than is observed in any ordinary experience of variations in fatality during a series of years in the same hospital from tracheotomy in diphtheria.

I confess to some surprise that the analysis of the tracheotomized cases treated by serum should have yielded results so strikingly favorable to antitoxin treatment. When one considers that the benefits of serum treatment are most strikingly apparent when the treatment is begun early in the disease and become more and more doubtful after the third day, it would not have been a convincing argument against the treatment if these benefits were not conspicuously manifest in cases of diphtheria requiring tracheotomy, for, as has been explained, the great majority of these tracheotomized cases are already the subject of advanced laryngeal stenosis when the antitoxin is first injected. There are, however, not a few cases which begin apparently as laryngeal diphtheria (*croup d'emblée*), or in which the involvement of the larynx occurs within twenty-four or forty-eight hours after the onset of the attack. That careful observation would reveal in many of these apparently primary or early laryngeal diphtherias a latent or slightly manifested diphtheric angina I believe to be true.

It is interesting to note that in several reports the benefit of serum treatment has been much more evident in the operated cases than in those not operated on, although this is not the rule. Indeed Leichtenstern and Wendelstadt find in their series of 123 cases that the difference in favor of the serum in their non-operated cases was so small as to be without significance, whereas there was a difference in favor of the serum of 20.8 per cent. in their tracheotomized cases with and without serum treatment. They attribute, therefore, the entire benefit of the serum in their experience to its action in tracheotomized cases. Their experience, however, is exceptional, although in a measure approached by that of Ganghofner and of Van Nes. On the other hand, in Vierordt's experience the entire benefit of antitoxin seemed to be in the non-operated cases. As has been repeatedly explained, such diversities of experience with limited numbers of cases is to be expected, and the norm can be established only by observations of large numbers of cases in different places and at different times. This norm is that both operated and not operated cases are benefited by antitoxin, and that the difference in each class between serum fatality and fatality from other methods of treatment is a large one.

The fatality of intubated cases in Table II, treated with antitoxin, is 28.9 per cent., which is 10.9 per cent. less than the

fatality of tracheotomized cases. Before the introduction of the serum treatment a collective investigation was set on foot by the German Gesellschaft für Kinderheilkunde to determine the average fatality following intubation. In 1893 von Ranke reported to the Society that 1445 cases of diphtheria with laryngeal stenosis treated by intubation gave a fatality of 62.5 per cent. This result was interpreted in favor of intubation as opposed to tracheotomy. There is a difference of 33.6 per cent. between this percentage and that obtained from our 342 intubated cases treated with antitoxin. This difference is so great that, after making all possible allowance for differences in the series of cases entering into the two groups of statistics, it seems impossible to explain it otherwise than as a powerful additional support of the arguments already presented in support of the claims of antitoxin. Here certainly the objection that the cases treated by antitoxin were light ones cannot be made.

Table II enables us to compare the fatality of 250 intubated cases treated with antitoxin with the fatality estimated on the assumption that the previous or simultaneous fatality from intubation in the same hospital had obtained in the several groups. By this calculation we find the actual fatality to be 31.6 per cent., and the estimated fatality 62.4 per cent. In other words, there was an apparent reduction in the fatality of intubated cases of 49.5 per cent. as the result of the serum treatment.

However distrustful one may be of statistical evidence in therapeutics—and previous experience justifies much distrust —I fail to see on what credible assumption this striking reduction of fatality can be explained otherwise than as demonstrative of the specific curative power of antitoxin in diphtheria.

Lamentable for the victims but adapted to convince the skeptical were the experiences of Baginsky and Ganghofner during the periods of failure in the supply of serum. During the enforced two months' interruption of the serum treatment (August and September) in Baginsky's service there were 116 cases of laryngo-stenosis with a fatality of 62.2 per cent, as opposed to a fatality of 37.8 per cent. in the serum periods which preceded and followed the pause. The percentage of operations rose to 55.2 as opposed to 18.1 per cent. during the periods of serum treatment, and this without any change in the general character of the cases admitted. During the serum periods there were more intubations than tracheotomies, whereas during the pause there were 45 tracheotomies and 19 intubations, 13 of the latter requiring secondary tracheotomy. In Ganghofner's service the fatality of the operated cases rose from 13.6 per cent. to 68.9 per cent. during the interruption in the supply of serum.

There remain two points to be touched upon before dismissing the laryngeal stenoses. These are the substitution of intubation for tracheotomy in a larger and larger proportion of the laryngeal diphtherias requiring operative interference and treated by the serum, and the shortening of the period during which the tube or the tracheal canula is required to be kept in the air passage.

An agent which would arrest the progressive descent of the diphtheritic process from the larynx into the bronchi and hasten the disappearance of the obstructive exudate is just what was needed to make intubation the ideal operation for the relief of the great majority of cases of croup requiring operative interference. Such an agent we now possess in antitoxin for a large group of cases, and we are not surprised, therefore, to find that the employment of intubation, as a substitute for tracheotomy, has been greatly extended by the introduction of serum therapy.

Several writers give figures showing that serum therapy materially hastens the time when extubation or removal of the tracheal canula is permissible, but I have not attempted to collect these figures.

Of the 3127 not operated cases, including as already stated many cases of croup, 350 died, giving a fatality of 11.2 per cent. In V. Hirsch's statistics of diphtheria from von Bergmann's clinic for ten years the average fatality of not operated cases (1004) was 26 per cent., varying only from 25.9 per cent. during the first four years of the period to 27.3 per cent. during the last four years. There is, however, no general standard of fatality for cases of diphtheria not operated on. The variations are within very wide limits, as might be expected. Only a comparatively small number of the reports give separately the previous or simultaneous fatality of non-operated cases not treated with serum. I find in the reports the following data on this point. In Roux, Martin and Chaillou's report the previous fatality of non-operated cases averaged 33.9 per cent., the minimum being 32.1 per cent., and the maximum 47.3 per cent., as opposed to 12.8 per cent. under the serum treatment; in Baginsky's report the corresponding figures are 31.6 per cent. versus 10.9 per cent.; in Bokai's 34.5 per cent. versus 14 per cent.; in Ganghofner's 15.8 per cent. (the lowest in a series of years) versus 12 per cent.; in Van Nes 33 per cent., the average of ten years, with a minimum of 16 per cent. and a maximum of 41 per cent. versus 13.3 per cent.; in Leichtenstern and Wendelstadt's 15 per cent. versus 10.4 per cent.

Age is a factor of such prime importance in the prognosis of diphtheria that I have prepared the following table (Table III), in which the cases treated with serum collected from twenty-five reports are classified according to age. Unfortunately there is very little uniformity of system in the different reports in giving the results according to the ages of the patients, many of the reports simply stating the number of adults or the maximum age of the children or the number of cases under a certain age or the number between arbitrarily selected limits of age, etc., so that many of the reports were not used for the following table. In each space in the table the upper number is the total number of the cases belonging to the heading, and the lower number is the number of deaths among these cases.

The most frequently quoted percentages of fatality in diphtheria according to the age are found (Hermaun?) as follows:

Under 1 year .... 80 per cent.
1–3 years .... 40 ''
3–5 '' .... 40 ''
5–10 '' .... 13 ''
Over 10 years .... 11 ''

TABLE III.

AGES OF PATIENTS TREATED WITH ANTITOXIN.

In each space the upper number is that of the cases and the lower that of the deaths.

REPORTER.	Tot'l. Cases.	Under 1 yr.	1–2 years.	2–3 years.	3–4 years.	4–5 years.	5–6 years.	6–7 years.	7–8 years.	8–9 years.	9–10 years.	10–12 years.	12–15 years.	Over 15–16.	REMARKS.
Kossel	115 / 15·15 per ct.														Of 5 infants under 2 years 4 recovered and 1 died.
Körte	52 / 30·43 per ct.														Of 4 cured cases the ages are not stated.
Baginsky	56 / 51·15 per ct.	Under 2 years.	2–4 years.			4–8 years.		6–8 years.		8–10 years.		Over 10 years.			Deutsche Med. Wochenschrift, Jan. 16, 1896.
v. Wahrendorf	89 / 24·74 per ct.	Under 2 yrs.													
Schroeder	62 / 12·7 per ct.	Under 2 years.											Over 10 years.		60 cases were under 5 years of age.
Bokai	124 / 23·8 per ct.														69 cases were under 3 years of age.
Henm	30 / 22 per ct.														
Unterberger	21 / 18·5 per ct.											7·13 years.			Of 21 under 4 years of age 13 recovered.
Berger	60 / 2·65 per ct.											Over 8 years.			16 cases were 8 years old or over.
Hager	45 / 11·1 per ct.														Private practice.
Senz	7 / 7·56 per ct.	Under 4 years.				4–6 years.			7–15 years.						One fatal case was 13 months, the other 18 months old; both with laryngeal diphtheria.
Seitz	36 / 5·15 per ct.											10–15 years.			
Reported in British Medical Journal, Feb. 2, 1895.	56 / 35·52 per ct.						5·10 years.					15 years.			
Goodall	73 / 14·84 per ct.											10 years.			British Med. Journ., Jan. 12, 1895. These are the ages of the cases previously reported by Washbourn, Goodall and Card.
Hall	11 / 3 / 27·3 per ct.														
Epidemic in Trieste. Hospital Cases.	165 / 27·25·5 per ct.														10 cured cases are not accounted for in this series.
Epidemic in Trieste. Cases in private practice.	72 / 5·62 per ct.											10·13 years.			Private practice.
Biumenfeld	50 / 2·4 per ct.														Private practice.
Schwerew	15 / 6														
Rapmund	100 / 7·7 per ct.				3·5 years.							10–20 yrs.	Over 20 yrs.		Private practice. 14 cases were under treatment at time of report.
v. Muralt	58 / 2·3·4 per ct.							Over 3 years.							The latter fatal case was of a tracheotomized child 4 years old admitted on the 4th day of the disease; the former case was of an infant two years old with syphilis, measles and pneumonia.
Goldt and Whitehouse	11 / 15 / 6·4 per ct.														The fatal case in an adult was of a woman 29 years old admitted in a state of collapse on the 8th day of the disease and dying in 24 hours.
Winkfield	22 / 1·9·2 per ct.														
Van Nes	52 / 12·23 per ct.														
Leuchtenstern and Wendelstadt.	123 / 25·263 per ct.	0·2 years.	2·4 years.				Over 4 years.								Of 17 tracheotomized infants less than 2 years old, 9 died; of 13 unoperated patients less than 2 years old, 2 died; of 11 tracheotomized patients between 2 and 4 years, 4 died; of 21 unoperated cases between 2 and 4 years, 2 died.

As the cases in the preceding table were not classified according to the ages by a uniform plan in the different reports they cannot all be summarized in a single table, but the chief results can be presented as follows :

14 Reports.	Total.	0-2 yrs.	2-4 yrs.	4-6 yrs.	6-8 yrs.	8-10 yrs.	10-12 yrs.	12-15 yrs.		
Cases	1234	187	327	297	176	114	63		24	
Deaths	215	60	70	48	19	8	4			
Percentages	17.4	32.1	21.4	16.2	10.8	7	0.63	1.6	4.1	

In the following table the cases under 4 years are from 20 reports containing 1630 cases (fatality 17.6%) and those over 4 are from 17 reports containing 1451 cases (fatality 17.4%).

	0-2 years.	2-4 years.	4-10 years.	10-15 years.	Over 15 years.
Cases	263	411	681	129	
Deaths	86	84	95	11	
Percentages	32.7	20.4	13.9	8.5	

The following table gives the results for each year up to 5 and over 5 years.

18 Reports.	Total.	Under 1 year.	1-2 years.	2-3 years.	3-4 years.	4-5 years.	Over 5 years.	Undetermined.
Cases	982	34	112	118	116	140		
Deaths	179	16	37	36	17	31		(0)
Percentages	18.2	47.1	33	30.5	14.7	22.1	9.3	(0)

The table furthermore shows under one year 35 cases with 16 deaths or 45.7% ; under 2 years 201 cases with 37 deaths, or 33.3% ; under 3 years 304 cases with 93 deaths or 30.6%, and under 4 years 692 cases with 122 deaths or 17.6% (each of these four groups of cases being from a total number of cases in the first group of 1080 cases, in the second group of 1914 cases, in the third group of 1141 cases and in the fourth group of 692 cases, the average fatality for the whole number of cases being 17.3%.)

The percentages of fatality in V. Hirsch's statistics of 2658 cases from the surgical clinic in Berlin for 10 years and 7 months (ending July 31, 1894), according to age are:

Under 1 year..............................88.3 per cent.
　1–2 years....................................82.5　　"
　3–4 　"　　..................................63.9　　"
　4–5 　"　　........ ....56.6　　"
　5–6 　"　　..................................46.9　　"
　6–7 　"　　........... ....43.7　　"
　7–8 　"　　........ ....36.1　　"
　8–9 　"　　..................................28.1　　"
　9–10 　"　　..... ....31.1　　"
　10–11 　"　　........................... .....21.2　　"
　11–12 　"　　........ ....20.9　　"
　12–13 　"　　..................................18.5　　"
　13–14 　"　　.......... ....16.7　　"
　14–15 　"　　..... ....15.　　"
　15–16 　"　　................... ....12.5　　"
　Adults (72 cases)........................11.1　　"

Baginsky gives the following percentages from his service in the Kaiser- und Kaiserin-Friedrich Children's Hospital in Berlin as the mean of the four years 1890 to 1893 inclusive:

Under 2 years ....60.2 per cent.
　2–4 　years ....51.2　　"
　4–6 　"　　..... ....38.　　"
　6–8 　"　　..... ....28.9　　"
　8–10 　"　　............. ....24.5　　"
　10–12 　"　　...................... ....28.8　　"
　12–14 　"　　..... ....18.5　　"

Baginsky's results in Table III may be compared with this last list of percentages, otherwise I do not consider that these statistics of Herz, Hirsch and Baginsky furnish any certain standard of comparison for the percentages of fatality derived from Table III. I have cited them, however, in the absence of any such standard to show in a general way that these latter percentages indicate a low fatality according to age. The contrast between a fatality percentage of 33.3 for cases of diphtheria under two years of age treated with serum, and that of 60 to over 80 for cases of the same age not so treated is a striking one, even if a large allowance be made for differences in the characters of the cases in the two groups.

We come now to the consideration of the influence upon the fatality of the length of the interval between the onset of diphtheria and the first injection of antitoxin. In experiments upon animals this factor is decisive in determining the result.

It is the factor which Behring from the first has put in the foreground. His claim is that no death will occur from diphtheria if antitoxin is injected in sufficient dose at the beginning of the disease, and that the fatality will fall under 5 per cent. if the treatment in proper manner is begun before the third day of the disease.

Of course the only significance of this great emphasis upon the importance of early treatment is . . . . that cure is rendered more difficult the larger the number of the diphtheria bacilli, the greater the amount and intensity of their toxins, the greater the damage already inflicted by the bacilli and their toxins, and the more serious the complications and secondary infections. There is, however, no absolute parity between the length of time the disease has lasted before beginning treatment and the increase of these dangers. One case may become desperate within forty-eight hours after the onset, and another may present no grave symptoms after a week's duration. . . . .

microbic associations of the infecting bacilli, and especially the local and general susceptibilities of the patient, are factors no less important than the single factor of time in influencing the issue.

The individual peculiarities of each case must be considered. If all is judged according to one simple uniform standard—antitoxin cures the case or it does not cure the case—and it must be confessed this is all which seems to be in the minds of many, then the practitioner will not come to any clear conception of the wonderful powers of the healing serum. The sins of some observers in this matter seem incredible. They lump together indiscriminately all of their cases, including those complicated with measles, scarlet fever, tuberculosis and other diseases, the mixed infections, the anginas, the croups, the advanced and the early cases, the true and the false diphtherias, the infants and the adults, and throw them into the scale to be weighed for or against antitoxin. An unsuccessful case is put down to the discredit of antitoxin without reference to its peculiarities. On the basis of experience in treating a dozen cases, the writer boldly attacks results established by the careful observation of hundreds of cases. It is true we need these brute figures for comparison with former fatality statistics of diphtheria, and they have served to demonstrate the curative efficacy of antitoxin, but reports of personal experience with the serum treatment should at least contain the data for an intelligent analysis of the cases treated. Such an analysis is requisite in order to reveal the full scope and capabilities of the new treatment. We have already seen that the study of the cases with reference to laryngeal involvement has brought to light evidence in favor of the serum treatment more convincing than that derived from the gross statistics of all cases treated, and evidence of a kind which meets many of the objections which have been urged against the interpretation of the gross statistics as demonstrative of the efficacy of antitoxin. We shall now see that the analysis of the cases according to the day of the disease on which the serum treatment is begun almost, if not completely, substantiates Behring's original claims, astounding as they seemed to be.

There is, of course, in many cases considerable uncertainty as to the exact duration of the disease at the time when the patient is first seen by the physician. The statements of parents or of those in charge of the children are often the only evidence on this point which can be obtained. Satisfactory information will be particularly difficult to obtain in the class of patients in the diphtheria wards of hospitals, these patients being chiefly the children of laborers. We are also to consider that a diphtheric affection of the throat may exist without such manifest disturbance as to attract even intelligent observation, or it may be mistaken for a simple sore throat. A tabulation of cases of diphtheria according to the day of beginning treatment will be, therefore, only of relative value, but we can fairly assume that the duration of the disease will very rarely, if ever, be shorter, but often longer, than that stated.

In the excellent reports on antitoxin treatment from the Paris hospitals, the cases are not analyzed according to the day of beginning treatment, as Roux, whose scheme of classifi-

cation has been followed by most other French writers, stated in his original article that it was practically impossible to obtain trustworthy statements on this point from parents of the children. Most of the reports, therefore, which enter into Table IV are from German and English sources.

The statements as to the day of the disease are entirely from information obtained from parents and others, and are not estimates on the part of the physician, although in several instances the reporter says that the condition of the patient plainly indicated a longer duration of the disease than that assigned by the parents and put down in the report. It will be observed that not all of the reports in the table fit into any one system of classification, and therefore not all can be summarized in a single table. In each space the higher number is the total number of cases belonging to the heading, and the lower is the corresponding number of deaths.

As is well known, the fatality from diphtheria by any approved method of treatment is smaller the earlier in the disease the treatment is begun. This is clearly shown in the following table from the statistics of V. Hirsch of the cases treated in the surgical clinic in Berlin for ten years preceding August, 1894, and of course before the employment of antitoxin. The results are according to the day of the disease on which treatment was begun.

	First Day.	Second Day.	Third Day.	Fourth Day.
Cases,	241	405	323	416
Deaths,	44	92	124	223
Percentages,	18.3	22.7	38.1	53.6

	Fifth Day.	Sixth Day.	Seventh Day.	Eighth Day.
Cases,	203	525	506	239
Deaths,	136	219	367	191
Percentages,	67	67.4	72.5	81.6

The preceding table is not intended to serve as a standard of comparison for my tables giving the results of cases treated by antitoxin, as the classes of cases in the two groups are not comparable.

Philip[*] has reported from Baginsky's service the results of treatment, before the use of antitoxin, begun in the earliest stages of diphtheria, the patients being brothers and sisters of children with diphtheria who were examined for Löffler bacilli, so that opportunity was given for recognition of the disease at its onset. The fatality was 10.5 per cent. lower in these cases recognized and treated early than in the others. The fatality of the cases treated by Baginsky with serum during the first three days of the disease was 32.2 per cent. lower than the preceding average fatality of cases not treated with serum. Plainly some more potent healing factor than merely that of early treatment was present. The only difference in the methods of treatment of the two groups of cases was the use of antitoxin in the one and its absence in the other.

[*] Philip: Arch. f. Kinderheilk., Bd. XVI.

TABLE IV.
FATALITY ACCORDING TO THE DAY OF DISEASE UPON WHICH ANTITOXIN IS INJECTED.

(In each space the higher number is the total number of cases treated on the corresponding day, and the lower number is the number of fatal cases.)

REPORTER.	Total number of Cases Treated.	1st Day.	2nd Day.	3rd Day.	4th Day.	5th Day.	6th Day.	After 6th Day.	Undetermined.	REMARKS.
Kossel	117 — 13 (11.1 per ct.)	14 — 0	30 — 1	29 — 0	9 — 1	11 — 2	6 — 3	12 — 5	6 — 1	Fatality for first three days was 14 per cent.
Körte	121 — 40 (33.1 per ct.)									Of … during the first three days 8 died (21.6 per cent). The results following injection begun after the third day were less favorable.
Baginsky	535 — 83 (15.6 per ct.)	111 — 3	134 — 14	94 — 13	52 — 12	39 — 11	13 — 1	29 — 12	55 — 11	All of the three fatal cases of the first day were far … the parents as to the date of beginning of the disease were probably erroneous (Baginsky). Fatality for first three days …
v. Mering	74 — 4 (5 per ct.)									Treatment begun on 1st or 2nd day in nearly all cases.
v. Noorden	81 — 19 (23 per ct.)									Treatment begun on the 3rd or later day in nearly all cases.

REPORTER.	Total number of Cases Treated.	1st & 2nd Day.	3rd & 4th Day.	After 4th Day.						REMARKS.
Schroeder	63 — 8 (12.7 per ct.)	23 — 1	27 — 3	13 — 4						

REPORTER.	Total number of Cases Treated.	1st Day.	2nd Day.	3rd Day.	4th Day.	5th Day.	6th Day.	After 6th Day.	Undetermined.	REMARKS.
Vierordt	55 — 8 (14.6 per ct.)	3 — 0	14 — 2	17 — 2	9 — 0	7 — 3	1 — 0	4 — 1		
Rumpf	26 — 2 (8 per ct.)		18 — 1	3 — 1	After 3rd Day. 5 — 0					4 cases were still under treatment at date of the report.
Ganghofner	110 — 14 (12.7 per ct.)	3 — 0	30 — 2	35 — 3	18 — 4	9 — 3	2 — 0	13 — 2		
Heim	27 — 6 (22 per ct.)		9 — 0	2 — 1	7 — 1	3 — 1	1 — 0	5 — 3		
Börger	30 — 2 (6.6 per ct.)	3 — 0	13 — 0	9 — 0		3 — 1	1 — 0	1 — 1		
Hager	25 — 1 (4 per ct.)	14 — 1	5 — 0	4 — 0	1 — 0			1 — 0		Private practice. The single fatal case died of complications after cessation of the diphtheria.
Kuntzen	25 — 3 (12 per ct.)	3 — 0	6 — 0	7 — 1	2 — 0	2 — 0	1 — 1	4 — 1		
Schmidt	14 — 3 (21.4 per ct.)									The three fatal cases were not treated until after the disease had lasted for 8 to 14 days. Private practice.
Seitz	35 — 2 (5.7 per ct.)		10	12	9	After 4th Day.				The two deaths were in infants 1½ years and 13 months old with advanced laryngeal diphtheria on day of admission, presumably therefore treated after 2nd or 3rd day, although this is not stated.
Hall	11 — 3 (27.3 per ct.)	2 — 0	4 — 0	4 — 2		1 — 1				
Epidemic in Trieste Hospital cases	105 — 27 (25.7 per ct.)	6 — 0	30 — 5	29 — 9	20 — 5	11 — 4	7 — 3	2 — 1		
Epidemic in Trieste Cases in private practice	72 — 5 (6.9 per ct.)	14 — 0	27 — 2	18 — 1	8 — 2	2 — 0	2 — 0	1 — 0		
Wittbauer	36 — 5 (14 per ct.)	4 — 0	8 — 2	4 — 1	6 — 0	3 — 0		11 — 2		

REPORTER.	Total number of Cases Treated.	1st & 2nd Day.	3rd & 4th Day.	After 4th Day.						REMARKS.
Blumenfeld	50 — 2 (4 per ct.)	40 — 0	8 — 1	2 — 1						Of the 2 fatal cases, in one the treatment began on the 4th and in the other on the 5th day. Private practice.

REPORTER.	Total number of Cases Treated.	1st Day.	2nd Day.	3rd Day.	4th Day.	5th Day.	6th Day.	After 6th Day.	Undetermined.	REMARKS.
Rapmund	100 — 7 (7 per ct.)	39	34	15	5	3	1	3		The deaths are given for the 1st and 2nd, the 3rd and 4th and the 5th, 6th and after 6th day respectively
		2		3		2				
Schaewen	15 — 0	6 — 0	3 — 0			1 — 0				Of the 3 …
Risel	114 — 9 (7.9 per ct.)		78 — 4	21 — 4	4 — 0	4 — 0	5 — 1			… hospital …
v. Muralt	58 — 2 (3.4 per ct.)	11 — 0	18 — 0	17 — 0	After 3rd Day. 12 — 2					
Codd and Whitehouse	11 — 4 (36.4 per ct.)	1 — 0	2 — 0	5 — 2		2 — 1		1 — 1		
Winkfield	22 — 4 (18.2 per ct.)		8 — 2	2 — 1	1 — 1	2 — 0		1 — 0		Of the 2 fatal cases … glandular swellings, and in the other … branes in the throat, nasal discharge … swellings.
Howard	10 — 3 (7.5 per ct.)	2 — 0	7 — 0	2 — 0	2 — 1	3 — 0	2 — 2			Private practice.
Van Nes	52 — 12 (23 per ct.)	2 — 1	13 — 1	10 — 1	7 — 2	5 — 3		12 — 4		
Kurth	97 — 10 (10.3 per ct.)	12 — 0	35 — 2	16 — 1	19 — 3	5 — 1	1 — 1	7 — 2		

The following table is the summary of the 19 reports of the preceding table, in which the number of cases and the fatality according to the day of the disease on which antitoxin treatment was begun is given for each day up to and after the 6th day.

19 Reports.	Total.	1st Day.	2nd Day.	3rd Day.	4th Day.	5th Day.	6th Day.	After 6th Day.	Undetermined.
Cases	1489	222	456	81	135				
Deaths	212	5	42						
Percentages	14.2	2.2	8.1	13.5					

... g with the preceding 19 reports those of Schroeder, Blumenfeld and Rapmund, we have the following table which gives the results of antitoxin treatment begun on the 1st and 2nd, on the 3rd and 4th, and after the 4th day.

32 Reports.	Total.	1st and 2nd Day.	3rd and 4th Day.	After 4th Day.	Undetermined.
Cases	1702	814	534	286	(68)
Deaths	229	45	81	91	(12)
Percentages	13.5	5.5	15.2	31.8	(17.6)

It may also be computed from the table that of 1729 cases of diphtheria with a fatality of 14.9%, 1115 cases treated with antitoxin during the first three days of the disease yielded a fatality of 8.5%, whereas 546 cases in which antitoxin was first injected after the third day of the disease yielded a fatality of 22.8%. Of 232 cases in which treatment was begun on the first day 5 (2.15%) died; of 492 cases in which treatment was begun on the second day, 38 (7.7%) died; of 331 cases in which treatment was begun on the third day, 43 (13%) died.

Kohts, an opponent of the serum treatment, at the recent Congress for Internal Medicine in Munich, claims for his method of local treatment no deaths among cases treated on the first day of the disease. For later days his results are much higher than those in the serum statistics. The percentages of deaths according to the day of beginning his treatment, as given by Kohts, without a statement of the number of cases treated, are as follows: 1st day, 0; 2nd day, 20 per cent.; 3rd day, 47 per cent.; 4th day, 55 per cent.

Table IV shows that out of 232 cases in which it is alleged that antitoxin was injected on the first day of the disease, 5 died. As a matter of fact, however, the assumed duration of the disease in each of these fatal cases is doubtful, as it rests solely on the statements of parents or those who cared for the children, and is apparently contradicted in at least the three cases concerning which any details are given by the condition of the patient on admission. Baginsky's three cases (Nos. 311, 479 and 511 of his tables) when admitted were far advanced in the disease, with extensive membranous exudates, cyanosis and very bad general condition. Hager's case may more readily be accepted, as it occurred in private practice, but here the patient died after disappearance of the diphtheria from complications, whether or not referable to the diphtheria is not stated.

Of the fifth fatal case reported by Van Nes no details are given in such form that the case can be identified from his description, but he himself places little reliance upon the alleged duration of the disease in the class of patients admitted to the hospital, these being the children of laborers.

I am not aware of the report of any fatal case of diphtheria properly treated by antitoxin within the first 24 hours after the beginning of the disease, in which the duration was positively determined, still as I have not read every article which has been published on the subject it is possible that such a case may have been reported. There are, however, many such cases of prompt recovery reported as that quoted from Hall in Table IV.

It is noteworthy that the percentage of deaths in 814 cases in which treatment was begun before the third day of the disease is only 5.5. If the doubtful deaths attributed to the first day be excluded, the percentage actually falls a trifle short of 5. If we furthermore make allowance for the fact that the assigned duration of the disease can scarcely be shorter, but may readily be longer than the actual duration, then our tabulation of 1702 cases of diphtheria according to the day of beginning treatment verifies Behring's original pre-diction. I do not, however, consider that it is justifiable from so small a number of cases and from material of the kind composing our table to draw any definite conclusions as to the exact percentages of deaths according to the date of beginning treatment.

According to the table the percentage of deaths in cases in which the serum treatment is begun on the 3rd and 4th days of the disease is nearly three times greater than that in cases treated on the 1st and 2nd day, and the percentage after the 3rd day is 3¼ times greater than that of cases treated within the first three days.

We are of course not to infer from these results that antitoxin may not be beneficial when administered after the 3rd or 4th day of the disease. There are cases which are still mild after this duration, but which subsequently become serious, and even in desperate cases antitoxin holds out some hope of cure.

It is apparent that the largest proportion of cures by antitoxin are to be expected from private practice among those who call the physician in at an early stage of the disease. While a similar statement may be made concerning any other suitable method of treatment, it is not, I believe, true in the same measure as for the serum treatment.

The main purpose of this article has been the study of the evidence thus far published concerning the curative power of antitoxin in diphtheria. I do not propose to consider the practical points relating to the employment of antitoxin, nor to consider in detail the specific effects of injection of the healing serum. There has been much diversity of opinion as to these effects, and I shall present briefly the principal points which seem to me to be established.

Most writers approve of the continuance of such measures of local and general treatment as have hitherto been found to be useful, but recommend the avoidance of all irritating and caustic local applications.

The injection of the serum may be followed in a few hours by local pain, swelling and redness, but there is no danger of abscess formation if the serum is uncontaminated and proper antiseptic precautions are taken. In over 3000 injections Martin observed the formation of an abscess only three times.

In twenty-four to forty-eight hours after the injection the general condition of the patient is remarkably improved in the great majority of those patients who are in a condition to be benefited at all by antitoxin. This general improvement is accompanied by a fall of temperature, which may be a critical fall, especially if the disease is not far advanced;

often it is a fall by lysis. Some hold that there may be a temporary rise of temperature as an immediate effect of the injection. Accompanying the fall of temperature is improvement of the pulse as to frequency and tension, but the heart's action may for some time, even into the period of convalescence, remain weak.

In the favorable cases the local diphtheritic process is arrested, usually within the first twenty-four hours after the injection. Membrane may appear upon spots previously inflamed and invaded by the bacilli, but otherwise there is no extension of the membrane in the majority of the cases which are benefited. The area covered by membrane becomes sharply demarcated and the swelling of adjacent mucous membrane disappears. The membrane may disappear by rapid separation or by gradual softening. Sometimes it persists for several days after disappearance of all other local disturbance. Large membranous casts are coughed up from the larynx, trachea and bronchi under the serum treatment more frequently than under former methods. The rapid separation of the membrane in the lower air passages may cause sudden increase of stenotic symptoms. Nasal discharge is lessened. The swelling of the glands in the neck and the surrounding œdema disappear, so far as these are not referable to secondary infections.

The most uncertainty prevails as to the influence of antitoxin in preventing the three most important complications or sequelæ of diphtheria, nephritis, heart failure and paralysis. The weight of evidence is that genuine nephritis is far less common in cases treated by antitoxin sufficiently early than under other methods of treatment, but it is questionable whether albuminuria is less common, although it is considered to be by Kossel, Roux and others. If there is an albuminuria in any way directly referable to the injection of the serum, and this is by no means established, it is simple albuminuria with perhaps a few narrow hyaline casts but without evidence of any serious damage to the kidney. Peptonuria, it is claimed by Hecker, is an effect of the serum, but it is without clinical significance. Albuminuria is such an extremely common symptom of diphtheria that it must be very difficult to determine that it can be referred to the serum in any case.

Many writers emphasize especially the favorable influence of antitoxin upon the heart, but there are some who have observed that with decided improvement in all other symptoms the force of the heart may still remain weak and occasion anxiety. Baginsky's experience is that the minor disturbances of the cardiac action are not less frequent in cases treated with serum, they appear to be even more frequent as a larger number of cases survive, but that actual death from heart failure is far less common in the serum cases than in others.

Post-diphtheric paralyses may occur in cases treated with serum as early as the second or third day of the disease. Whether they occur in cases treated within the first twenty-four hours is not certain. According to some, paralysis is even more common in the serum cases than under former methods of treatment. This is doubtful, but if true, it may be attributed to the survival of a larger proportion of cases.

It is apparent from what has been said that antitoxin is most strikingly beneficial in progressive fibrinous diphtheria and especially in the prevention and cure of laryngeal diphtheria. In septic diphtheria the serum treatment is of little avail.

Antitoxic serum may produce unpleasant effects, but these do not involve danger to the patient. They are in all probability referable to the serum as such and not to the healing, so-called antitoxic, substance contained in the serum. The most common undesired effect is some form of exanthem, usually erythema and urticaria, sometimes an eruption like measles or scarlatinal rash. The same exanthems have been observed by Bertin after the injection of ordinary serum of the horse, and by Richardière after injection of Marmorek's anti-streptococcus serum.

The serum from some horses is more likely to cause these exanthems than that from others, and there may be individual idiosyncrasies favoring their occurrence. Some writers report the occurrence of an exanthem in not more than five per cent. of their cases, others have observed them in over fifty per cent. of the cases treated with serum. They may be localized in the neighborhood of the seat of injection or extend from that over the greater part of the body, or make their first appearance at a distance from the point of injection. Often without noticeable fever they may be accompanied by considerable elevation of temperature and by pain and swelling in the joints. A rarer but more severe form of serum exanthem resembles erythema multiforme, and when this is accompanied, as it may be, by high fever, and severe pain in the bones and joints with swelling of the joints, the condition of the patient may really seem serious, but these patients recover. Some have attributed a petechial eruption to injection of the serum, but this may occur in diphtheria without serum treatment.

These occasional untoward effects of the healing serum are annoying, but, being unattended with danger to life and without serious consequences, they do not contraindicate the use of the serum.

There have been a few cases reported in which the writers, without any satisfactory evidence whatever, have referred the death of the patient to the use of the serum. The essential harmlessness of the serum has been demonstrated by over a hundred thousand injections,[*] and if future investigations should show that through some idiosyncrasy on the part of the patient death ever is attributable to the injection of the serum, this would probably count for about as much as the rare deaths from the use of ether or chloroform.

I shall leave untouched the question of the immunizing properties of antitoxin.

The principal conclusion which I would draw from this paper is that our study of the results of the treatment of over 7000 cases of diphtheria by antitoxin demonstrates beyond all reasonable doubt that anti-diphtheritic serum is a specific remedy

* This would seem to be at least a moderate estimate, as writing November 20, 1894, Behring says that there had been by that date certainly over 40,000 injections (Die neue Behandlung der Diphtherie von Dr. Behring, Berlin, 1894, p. 25).

tive agent for diphtheria, surpassing in its efficacy all other known methods of treatment for this disease. It is the duty of the physician to use it.

The later reports show in general a decided improvement in the results of the treatment over the earlier ones, and there is every reason to believe that the results of the second year's employment of the new treatment will make a much more favorable showing than those of the first year. We shall come to a clearer understanding of the mode of action of the healing serum. Improvements in the methods of preparation and preservation of the serum, and possibly the separation of the healing substance, at least from other ingredients which produce the undesired effects, may be expected.

The discovery of the healing serum is entirely the result of laboratory work. It is an outcome of the studies of immunity. In no sense was the discovery an accidental one. Every step leading to it can be traced, and every step was taken with a definite purpose and to solve a definite problem.

These studies and the resulting discoveries mark an epoch in the history of medicine. It should be forcibly brought home to those whose philozoic sentiments outweigh sentiments of true philanthropy, that these discoveries which have led to the saving of untold thousands of human lives have been gained by the sacrifice of the lives of thousands of animals, and by no possibility could have been made without experimentation upon animals.

A MORE RADICAL METHOD OF PERFORMING HYSTERECTOMY FOR CANCER OF THE UTERUS.

By J. G. CLARK, M. D., *Resident Gynecologist.*

The onset of carcinoma of the uterus is so insidious, and its early stage gives rise to so few disagreeable subjective symptoms, that finally, when the patient is forced by repeated hemorrhages, which usually first alarm her, to consult a physician, the disease has passed beyond the possibility of a radical operation for its cure.

The route of upward extension is almost invariably by the broad ligaments; and on account of the close attachment of the lower portion of the ligament to the cervix, the progress is rapid through the intraligamentary lymphatics, and if not checked in the early stage is soon beyond the limits of any operation.

The downward growth on the vaginal walls and the metastasis from this point is often so very extensive that it also cannot be removed by the usual methods.

A casual review of the literature of the operative treatment of carcinoma is sufficient to convince one of the inadequacy of any method of treatment; but as the operative method is the only one which offers any chance of cure or benefit at present, it should be employed in all cases where the disease has not passed beyond the palliative effect of hysterectomy.

If the broad ligaments are densely infiltrated and the cervix deeply excavated, any form of radical operation is out of the question, as there is no possibility of even alleviating the symptoms.

If on the other hand the cervix is extensively ulcerated and the broad ligaments only slightly involved, the prognosis is favorable at least for the euthanasic effect of hysterectomy, and in a certain proportion of cases the disease can be removed completely even by the ordinary methods of hysterectomy.

During the last six months the clinical courses of three inoperable cases admitted to the gynecological wards of the Johns Hopkins Hospital have been closely followed, and in reviewing the histories of these cases in conjunction with the autopsy notes, we are more than ever convinced that any measure which offers the slightest prospect of mitigating the agonizing pain and relieving the symptoms caused by pressure of the growth upon the rectum and ureters should urgently be advised.

Death in cases which are not operated upon is usually caused by obstruction of the ureters (uræmia), peritonitis, or toxæmia from septic absorption.

The involvement of the ureters is usually late, but many weeks before this complication arises the sacral plexus may be pressed upon in one or both sides of the pelvis by the carcinomatous masses wedged into the inferior strait, and the patient suffer the most agonizing sacral and sciatic pain.

One of the three cases just referred to was of this type. The patient was admitted to the hospital six months before her death, and throughout the remaining days of her life was not free from pain a single hour, even under the influence of large doses of morphine.

The autopsy revealed a dense board-like infiltration of the broad ligaments which extended out to the pelvic wall, involving the sacral plexus at its points of egress from the sacrum. In this case had the uterus and broad ligaments been totally extirpated, even six months before the patient was admitted, the progress of the disease would probably not have been arrested, but she would have been spared the frightful agony of the last six months of her life by the relief of the pressure on the nerves. The left ureter in this case was completely blocked, and in addition to the pressure pains which she suffered there was present a partial uræmic toxæmia for three months before death which caused constant nausea and considerable vomiting.

The second patient, a mulatto woman, was admitted three months before death with a deep crater-like excavation of the cervix and dense induration of the broad ligaments. She suffered intense pain, which was only partially controlled by morphine, and at last died of peritonitis from perforation of the lateral wall of the uterus into the peritoneal cavity. Her abdomen became intensely tympanitic, and for five days before death her temperature ran as high as 105° to 107° F.

In the third case death resulted from uræmia, both ureters being blocked, and in addition there was a pyelonephrosis and ureteritis on one side. For 72 hours before death there was total suppression of urine. In these cases we have exemplified the three usual terminations of carcinoma which are not subjected to operation: (1) asthenia and uræmia from toxic absorption; (2) peritonitis from perforation of the uterus, and (3) uræmia, and pyelonephrosis from septic infection. These three cases also give us a vivid composite picture of the frightful suffering which these unfortunate women experienced.

The offensive discharge from the necrotic tissue is another excessively disagreeable symptom which invariably appears as soon as the ulcerative process is well under way, and can only be stopped by a complete removal of the carcinomatous tissue. This is of itself a justifiable indication for operation, as the discharge is always checked for some time, and frequently does not reappear even though the disease continues to extend.

It is Dr. Kelly's rule to advise hysterectomy in all cases which have not passed beyond the limit of the palliative effect of the operation, even though there is no possibility of a cure, simply for the relief of the inevitable symptoms which must arise if the uterus is not removed.

For the radical cure of cancer of the uterus the same surgical rule obtains as in cancer of other regions, viz. total extirpation of the primary focus and as extensive areas of adjacent tissue as possible to insure the complete eradication of the disease.

It cannot be gainsaid that it is better to have a local recurrence and ultimate death from metastasis following the removal of the uterus, with a decided amelioration of the usual distressing symptoms, than to have these symptoms increasing in their severity until death without operation.

The faults common to all methods of removing the uterus are (1) the broad ligaments are cut too close to the uterus, and (2) too small portions of the vagina are removed. (Fig. III.)

In at least 95 per cent. of cases where there is upward extension of the disease it is through the lymphatics of the broad ligaments. The local recurrence which we so often see on the margins of the vaginal incision also demonstrates very clearly the fact that usually too little of the vagina is removed.

In carcinoma of the fundus the extension is invariably through the broad ligaments, and any operation which removes a considerable portion of these structures offers the greatest hope of a permanent cure.

The usual methods of performing hysterectomy have been extremely unsatisfactory to every gynecologist, for the reason that only a small portion of the broad ligaments is removed and the remainder usually conceals nests of epithelial cells which fall outside the limit of the knife. The same may be said of the vagina. The results of the pathological examination of the uteri removed by hysterectomy in the Johns Hopkins Hospital not only definitely sustain this clinical observation, but also point strongly to the necessity of a more radical method than yet proposed.

Of the last 20 cases, the specimens have been submitted to a most careful pathological examination, which has shown that in 15 cases the carcinomatous process had passed beyond the limit of operation; in one case the result was doubtful, and in only four cases could it be definitely said that all of the disease had been completely removed.*

No stronger argument than this can be advanced for a more radical operation.

In at least five instances where the extension had occurred along either one or both broad ligaments, the carcinoma could not have passed more than a few millimeters beyond the limit of operation, as the epithelial cells were very sparse and were only barely perceptible in the margins of the incision.

In other cases there was no involvement of the broad ligament, but too little of the vaginal wall had been excised.

In comparing Fig. III of a uterus removed by vaginal hysterectomy and Fig. IV of the specimen from Case II which was removed by the method which I shall describe, it will be seen that none of the broad ligament or the vaginal wall is removed with the former, while with the latter there is a large portion of the broad ligaments and a considerable cuff of vagina.

The great danger of cutting or ligating the ureters in the past (Fig. II) has prevented a wide excision of the broad ligaments, but now that Dr. Kelly has entirely removed this danger by introducing bougies into the ureters in all operations where they may be involved, we can turn our attention with greater confidence to the more extensive extirpation of the tissues adjacent to the uterus.

The value of this procedure has been frequently demonstrated in Dr. Kelly's clinic, and if generally adopted will no doubt save many lives which are lost from cutting or tying the ureters.

After laying a plan before Dr. Kelly for the more complete extirpation of the uterus, the broad ligaments and a portion of the vagina, and receiving his cordial endorsement and encouragement, I was granted the opportunity in April, 1895, to put into effect the principles embodied in the proposed operation. There are three essential steps in this operation which differ from those now employed: 1st, the introduction of the bougies; 2d, the ligation of the upper portions of the broad ligaments, including the round ligaments and ovarian arteries, cutting them close to the pelvic walls, opening the two layers and dissecting the uterine artery out to its origin and ligating before excising any tissue, and 3d, the excision of a much larger portion of the vagina than usual.

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* In a forthcoming article by Dr. Russell upon the surgical results of cases subsequent to hysterectomy for carcinoma in the Johns Hopkins Hospital, it will appear that there is a greater percentage of permanent cures than the pathological examination of these 20 cases would seem to indicate. From the opening of the hospital in 1889 to August 1894, 48 hysterectomies were performed, of this number 41 were vaginal, 4 abdominal and 3 combined vaginal and abdominal. The results of these operations are as follows: 5 died from the primary effect of the operation. If died subsequently from extension of the disease, 6 have not been heard from, and 20 are still living. Assuming that of the 5 not yet heard from 3 are living and 3 dead, there are 48 per cent of these cases still living, certainly a very gratifying result, as it has now been nearly a year since the last of this series of cases was operated upon.

By carefully ligating the artery in this way, and introducing the bougies, we eliminate the dangers of hemorrhage and of injury to the ureters, and are enabled to extirpate the uterus, its broad ligaments, and the upper portion of the vagina en masse.

The value of excising the carcinomatous tissue in one piece is dwelt upon with much stress by Dr. Halsted in the description of his operation for cancer of the breast, by means of which he has reduced the ratio of local recurrence from 50 to 20 per cent.[*] The same rule must hold good here.

He says "the suspected tissue should be removed in one piece: (1) lest the wound become infected by the division of tissue invaded by the disease or of lymphatic vessels containing cancer cells, and (2) because shreds or pieces of cancerous tissue might readily be overlooked in a piecemeal extirpation."

The principal reason for the careful dissection and exposure of the uterine artery is that one can tie it well out in its course and then, by making traction on the uterus towards the opposite side from which we are cutting, the broad ligament can be cut away close to its pelvic attachment, Figs. I and IV.

If one attempts to ligate the artery in the tissues any distance from the uterus without first dissecting it out, there is great danger of including carcinomatous tissue within the ligature and thus defeating the object of the operation.

Another reason for first ligating the artery as far out as possible is that there is no possibility of removing any more tissue after the broad ligament is once divided, as that portion attached to the pelvic wall at once retracts, carrying with it the artery and any carcinomatous tissue which may lie beyond the ligatures. This is the essential principle in the operation which is now proposed, and if followed will unquestionably give better results than where the broad ligament is ligated with one or two ligatures *en masse* and cut away close to the uterus.

While the introduction of the bougies is highly essential to this operation, it can be performed, but with much less facility, by following the course pursued on one side in Case I.

The bougie was not introduced in the right ureter for reasons stated further on, and when the enucleation was begun it was found necessary to dissect out the ureter in its course and draw it to one side with a loose traction ligature, after which the operation was completed with as much ease as on the side where the bougie was introduced.

This necessarily requires more time, and consequently it should be the invariable rule to lay bougies in both ureters, as the operation must be done with the most painstaking care if it is to be of any more value than the methods now pursued.

The details of the operation will be given in the description of the cases, and in the remarks following Case I defective points in the *technique* are noted which are corrected in Case II.

CASE I.—Mrs. J. P., mulatto, aged 48 years, admitted April 21, 1895.

* The Johns Hopkins Hospital Reports, Vol. IV, No. 6.

Complaint—Hemorrhage from uterus and offensive vaginal discharge.

Marital History—Married 25 years; 12 children; no miscarriages. All labors normal except the last in November, 1894; child still-born. Menses began when she was 14 years of age; flow always regular and painless, lasting one and a half days. Since the birth of her last child she has had almost constant hemorrhage.

Leucorrhœa for many years; up to six months ago the discharge was odorless, but at that time became very profuse and offensive.

Family History—Negative.

Personal History—Patient has always been a very healthy woman.

Present Ailment—In August, 1894, when patient was about six months pregnant, the leucorrhœal discharge above noted became very offensive and irritating, and she began to grow weak and lose flesh. November 16th, 1895, she gave birth to a still-born child, and about one month later had a copious hemorrhage from the vagina, which has continued more or less up to the time of her admission to the hospital. She has at no time suffered the slightest pain, and barring the weakness and general debility, which is more apparent to her friends than herself, feels very well. Urination normal, bowels costive, no pain during defecation. Patient is anæmic and has lost considerable flesh. Appetite poor, sleeps moderately well.

Examination—Abdominal walls lax and flabby, numerous linea albicantes. Vaginal outlet much relaxed; beginning on the vaginal wall 2½ cm. from the cervix there is a fungating mass which almost fills the vagina and completely involves the cervix. The broad ligaments are slightly involved close to the uterus. The fundus uteri is slightly enlarged and freely movable. Appendages normal.

Diagnosis—Cancer of upper portion of vagina and cervix.

Operation, April 26, 1895—Urethra anæsthetized with cocaine, and ureteral bougie inserted into the left ureter through a No. 8 vesical speculum. The patient being very nervous, and as the right broad ligament seemed quite free, it was deemed best to proceed at once with the general anæsthetic, only a slight attempt having been made to lay a bougie in this side, which was not successful. An incision 15 cm. in length in the median line exposed the pelvic organs, which were found as described in the examination. The bougie in the left ureter could be felt as a solid cord running up along the side of the cervix and then curving gently outward in company with the iliac vessels and up over the brim of the pelvis. At the base of the broad ligament it lay at least 1½ to 2 cm. outside of the indurated area, and could easily be displaced 1 cm. further out towards the pelvic wall, thus throwing it entirely out of the carcinomatous process.

The operation was begun by tying the upper portion of the left broad ligament, including the ovarian artery, as closely to the pelvic wall as possible, clamping the uterine side and cutting between.

Having divided the round and the upper portion of the broad ligaments, and separated the two layers of the latter, the vesical peritoneum was snipped with the scissors, following the crease where it is reflected onto the uterus, around the anterior

face of the uterus to the opposite broad ligament. By spreading the layers of the broad ligament apart with a stalk sponge the uterine artery was exposed in the intraligamentary cellular tissue, it appearing somewhat tortuous, and near the uterus imbedded in carcinomatous tissue. A careful dissection was now begun, an assistant in the meantime making strong traction with a small vulsellum forceps caught in the fundus, thus enlarging the normal space between the uterus and pelvic wall and making the artery taut.

The artery was bared for 2½ cm. from the uterus, the dissection being carried well down towards the internal iliac artery, which could be seen pulsating close to the point of ligation. A small blunt-pointed curved aneurism needle proved of great service in carrying the ligature. As the vessel walls seemed somewhat atheromatous, a second ligature was placed for double security. This step in the operation was rather difficult on account of the close proximity to the large vessels, which were in danger of injury. During this dissection the ureter was constantly under touch, thus eliminating all possibility of injuring it.

The ureter was next dissected out of its bed and pushed toward the pelvic wall; and the broad ligament and the intraligamentary tissue ligated on the pelvic side close to the internal iliac vessels, with imbricated ligatures, each including 1 cm. of tissue.

Having reached the vaginal vault, the dissection was carried down along the lateral and anterior vaginal walls with the fingers, by means of which the walls were pushed away from their attachments. There had not been the slightest loss of blood up to this point.

The upper portion of the opposite broad ligament was now ligated on the pelvic side and clamped on the uterine side and cut. The two layers were then separated with a stalk sponge, the uterine artery dissected out and doubly ligated. At this point careful palpation showed the broad ligament to be more extensively involved than the preliminary examination had indicated, and in order to remove as much as possible it became necessary to know the exact position of the ureter lest it inadvertently be ligated or cut.

With the other ureter as a comparative landmark, this ureter was easily located in the broad ligament and dissected out. A loose traction ligature was then thrown around it, and while the dissection was being carried down back of the vaginal walls, was drawn out of the way by an assistant. The broad ligament was ligated close to the pelvic wall as on the opposite side and cut. At this point it became evident that the carcinomatous process had not only penetrated the posterior vaginal wall, but had involved the anterior rectal wall to a considerable extent.

On account of the close relation of the rectal and vaginal walls which were bound together by the inflammatory process, an assistant was directed to insert his index-finger into the rectum while an attempt was made to separate the two walls. This could not be accomplished satisfactorily. The recto-uterine reflection of peritoneum had been previously snipped and pushed off in the same manner as the vesico-uterine reflection. By making strong upward traction on the uterus, the vagina was also drawn upward and made quite tense. By

light percussion, a procedure suggested by Dr. Kelly to be employed in all cases of hysterectomy for accurately distinguishing the cervico-vaginal juncture, the point for amputation can be located accurately. An opening was made in the anterior vaginal wall with the sharp-pointed scissors, and from this point the vagina was encircled by an incision made with Dr. Kelly's special hysterectomy spud, which proved of great value here in cutting so deep in the pelvis. Unfortunately a small area of carcinomatous tissue on the rectum could not be removed. With this exception the enucleation seemed to be very thorough. Considerable bleeding from the vaginal walls, which required several ligatures to control it, followed the amputation of the vagina. Before completing the operation another attempt was made to clear the rectal wall of the carcinomatous tissue by a careful dissection, but proved impossible. One or two large strips of iodoformized gauze were packed down into the space occupied by the cervix and upper portion of the vagina, after which the pelvic cavity was closed by whipping together the recto-uterine and vesico-uterine reflections of peritoneum by a continuous suture, beginning at the stump of one ovarian artery and running across to the opposite stump, thus effectually closing off the peritoneal cavity, which was then irrigated with 1 litre of normal salt solution (Fig. V). The abdominal wound was closed with buried silver wire and subcutaneous catgut.

The vaginal gauze was removed in five days. Patient discharged in 24 days. Examination at this time as follows: Vaginal vault smooth and vaulted, small line of cleavage felt where the vaginal walls have united. No sign of local recurrence of the disease.

The pathological examination had by this time been made by Dr. Cullen, who confirmed the clinical observation that all of the carcinoma had not been removed, consequently the patient was requested to return in one month for examination.

June 20—Patient examined to-day, and on the anterior rectal wall there is a minute area which is unquestionably carcinomatous. The patient is perfectly comfortable, has gained five pounds, the hemorrhages have not appeared and she believes she is perfectly well. The pelvis appears to be free, and by rectum there is no trace of induration on either side.

Remarks.—While the dissection of the ureter in which no bougie was introduced was unilaterally ——————, it was much slower than on the opposite side, and was ————— much more difficult. The bleeding from the vaginal walls following the amputation of the uterus could be controlled by perforating with sharp scissors the vagina anteriorly well below the carcinomatous area and then ligating the vaginal wall in small segments and cutting, thus controlling all hemorrhage as the operation proceeds (vid. Case II).

With the exception of the —— part, or the ———, which could not be removed, the operation was very satisfactory. As far as the ——————— is amplified ———————, unfortunately for the ————————— was ————————— although a much larger area was left.

CASE II.—Mrs. E. Y., ———— [————], aged 37, ——— admitted June 4th, 1895.

Complaint—Excessive loss of blood from uterus.

Marital History—Married twice, one child and one miscarriage during first marriage, labors easy and not followed by any untoward symptoms. Married 22 years to second husband, during which time she has borne three children and had ten miscarriages. Nothing out of the normal course of events occurred in any of the labors, and no pain or discomfort followed the miscarriages. She was attended in all of her confinements by a German midwife. Menopause occurred in her 47th year, up to that time menses always regular and normal since they first appeared in her 19th year.

Family History—Negative.

Personal History—Patient has always been very strong and healthy since childhood.

Present Ailment—One year ago she began to have a slight leucorrhœal discharge, which continued for six months, when it became blood-tinged; since then it has grown more profuse and hemorrhagic until the present, when it is almost pure blood.

About Easter, 1895, she had a severe hemorrhage, losing about one pint of blood.

General Condition—Slight anæmia, no cachexia, very slight pain in lower part of pelvis, no loss of flesh. Appetite good, bowels regular, no urinary complaint. Heart and lungs normal.

Examination—Vaginal outlet relaxed, faint scar tissue in posterior vaginal wall. Projecting into vagina from cervix there is a fungating mass 2.5x5 cm., which is very friable and bleeds freely during the examination.

The cancerous process seems to be circumscribed and extends only slightly onto the vaginal walls. Fundus uteri small, senile, freely movable, not involved by the carcinoma. Broad ligaments very slightly involved. Ovaries not detected, probably senile.

Diagnosis—Cancer of cervix.

Operation, June 6, 1895—Urethra anæsthetized with cocaine and patient placed in knee-breast posture. After an inffectual search for the ureteral orifices it was considered best to place the patient in the elevated dorsal posture, when they were quickly located and bougies inserted into both.

Especial care was observed in this case as in the preceding to disinfect thoroughly the vagina. The broad ligaments were tied off and the dissection of the artery made in the same way as in the preceding operation.

After freeing the vaginal walls for 2½ cm. below the cervix, the vagina was perforated anteriorly, but instead of at once completing the amputation, a small segment of the vaginal wall was ligated and cut and then another, and so on around the entire circumference, so that by the time the uterus with the upper portion of the vagina had been removed all bleeding was checked.

The operation was completed by packing gauze into the upper part of the vagina and closing the peritoneum over this, making the seat of operation entirely extra-peritoneal. This operation required two hours for its completion, the dissection of the uterine arteries requiring more time than any other step. It was practically bloodless and there was no variation in the patient's pulse from the beginning to the end.

The subsequent notes on the case are as follows:

June 7th—Patient recovered from ether by the time she reached the ward; at that time her pulse was 92, full and strong. She has passed a comfortable night. Temperature 99½° F.; pulse 100 this morning.

June 9th—Bowels moved thoroughly from the effects of fractional doses of calomel and an enema. Feels well; no tenderness or distension in abdomen.

June 10th—Gauze pack removed from vagina; no odor; slightly blood-stained.

June 18th—Temperature normal; abdominal wound inspected; subcutaneous catgut absorbed, union perfect, line of incision represented by only a faint hair-line.

July 5th—Patient discharged, feeling perfectly well. Highest temperature on fourth day 100° F.; pulse 112. The vaginal vault is entirely closed in, is perfectly smooth and dome-like. The line of union between its walls is represented by a small, almost imperceptible cicatrix. No induration in the lateral pelvic walls. Prognosis as to radical cure good.

August 30th—Patient returns to-day by appointment; again examined and same condition found as just noted.

In conclusion, the steps of this operation may be summarized as follows:

1. Insert bougies under the local effects of cocaine, thus saving time and conserving the patient's vital powers for the operation.

2. Make abdominal incision of sufficient length to insure free manual movements.

3. Ligate upper portion of broad ligament with ovarian artery; divide vesico-uterine peritoneum around to opposite side; push bladder off, and spread layers of ligament apart, exposing uterine artery.

4. *Dissect uterine artery out for 2½ cm. from uterus beyond its vaginal branch and tie.*

5. Dissect ureter free in the base of the broad ligament.

6. Ligate remainder of broad ligament close to iliac vessels and cut it away from its pelvic attachment.

7. Carry dissection well down below carcinomatous area, even though cervix alone seems to be involved.

8. Proceed on the opposite side in the same manner as on the first side.

9. Perforate vagina with sharp-pointed scissors, making strong traction on uterus with small vulsellum forceps so as to pull the vagina up and make its walls tense, then ligate in small segments (1 cm.), and cut each segment as it is tied.

10. Insert iodoformized gauze from above into raw space left by the hysterectomy; draw vesical and rectal peritoneum over this with a continuous fine silk suture.

11. Irrigate pelvic cavity and close abdomen without drainage.

July 15, 1895.
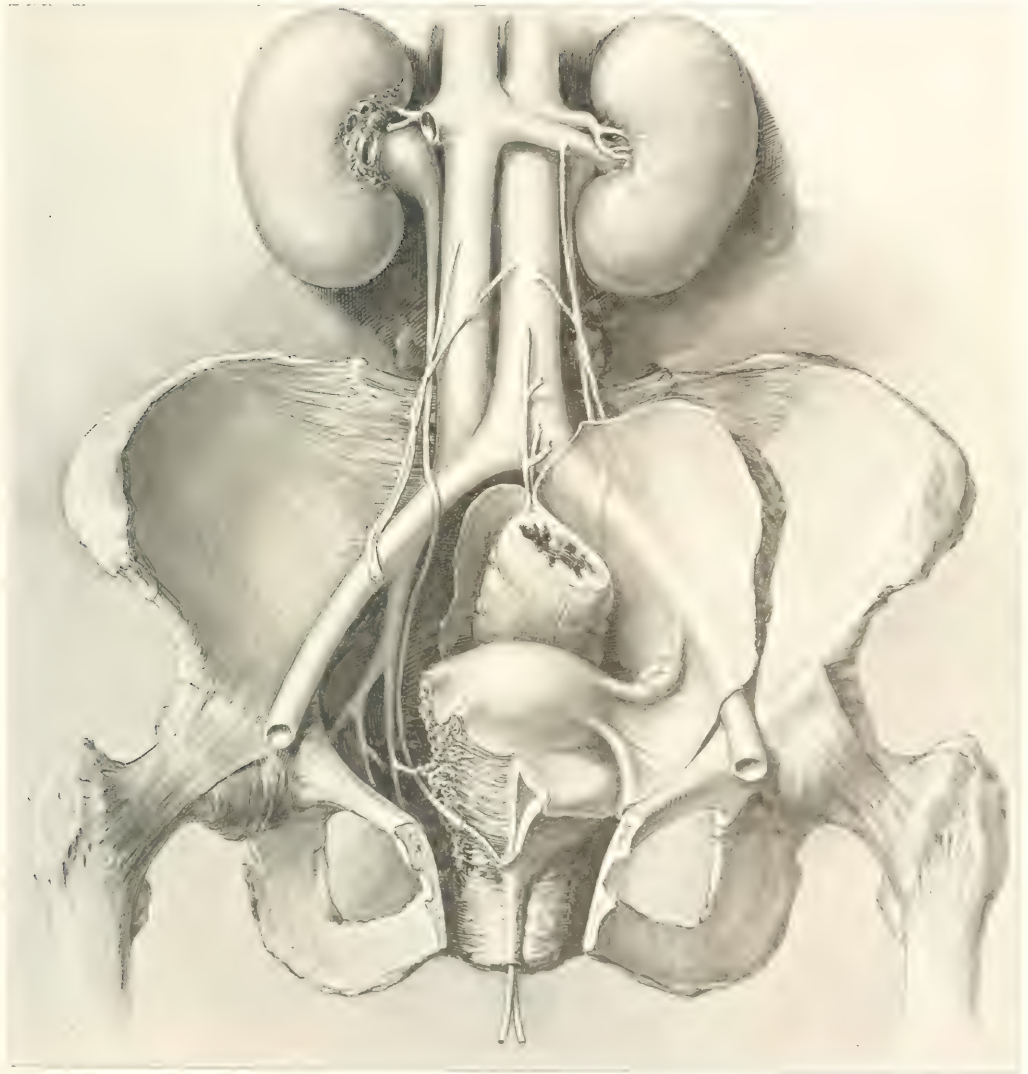
FIG. I.

In this plate the peritoneum of one side of the pelvis is dissected off, showing the [...........................] of the human uterus, uterine artery and ureter. Bougies are inserted into the ureters making them stand out as rigid tubes. The close relations of uterine artery and ureter and the ureter and cervical portion of uterus are well demonstrated, showing the impossibility of a wide excision of the broad ligaments without the introduction of the bougies into the ureters.

FIG. III.

Uterus removed by vaginal hysterectomy; none of the broad ligaments... vaginal vessel with it.

FIG. IV.

Uterus removed from Case II showing the... before the broad ligaments were freed from the... major portion of the broad ligaments at... excised with the uterus.

FIG II

Photomicro-dissected, giving a lateral view of the uterus and bladder with their relations to the uterine artery and ureter and the latter vessels in relation. The important relationships of removing any of the broad ligament without severe damage to uterus or bladder. The ureter is perfectly demonstrated in the plate.

FIG V

Operation as it appears when completed. The space left by the removal of the uterus is filled with gauze to restrain... the peritoneum are whipped over it with a continuous suture from... ...ing at one ovarian stump and running across to the opposite.

NOTES ON NEW BOOKS.

Laboratory Guide for the Bacteriologist. By Langdon Frothing-ham, M. D. V. (*Philadelphia : W. B. Saunders*, 1895.)

This little book is arranged and written for purposes of easy reference in laboratory work. It consists of a preliminary chapter on bacteriological technique, and a collection of the more common formulæ for the making of media, staining, etc.

The chapter on bacteriological technique is short and clear, and gives many little hints which are usually picked up by bitter experience and are not found in the ordinary text-book.

The formulæ are satisfactorily arranged, the chief objection to their rapid use being the constant occurrence of foot-notes referring back to previous formulæ or parts of previous formulæ.

Book of Detachable Diet Lists, for Albuminuria, Anæmia and Debility, Constipation, Diabetes, Diarrhœa, Dyspepsia, Fevers, Gout or Uric Acid Diathesis, Obesity, Tuberculosis, and a Sick Room Dietary. By Jerome B. Thomas, M. D. (*Philadelphia : W. B. Saunders*, 1895.)
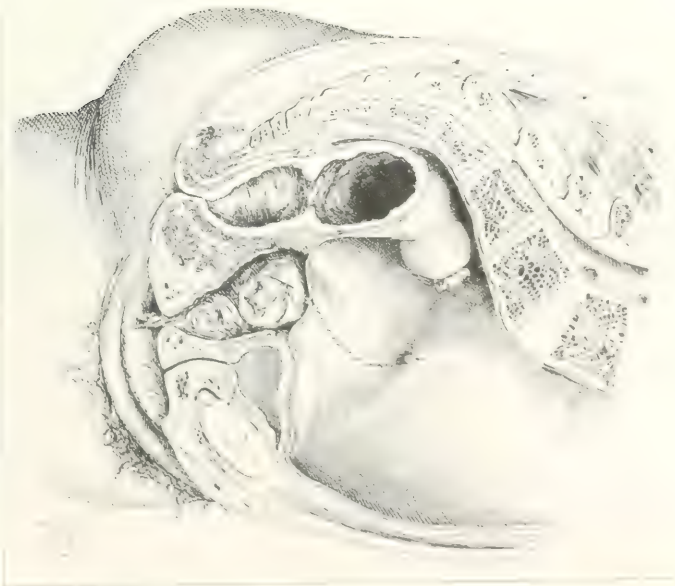
This book contains a set of ten lists of articles of food adapted to the various conditions named above. The dietary is printed upon the back of the physician's prescription, and the list of articles is a liberal one from which to select. As an aid to the physician's memory of available articles of food when arranging a dietary, the lists are very valuable. They will suggest a variety in diet which cannot but be helpful to the patient. The lists being perforated and easily detached, it will be practicable for the nurse to have before her constantly a scheme of feeding. They will be most useful.

A System of Surgery. Edited by Frederic S. Dennis, M. D., etc. assisted by John S. Billings, M. D., etc. (*Philadelphia : Lea Bros. & Co.*, 1895.)

The first volume of this system opens with a section on the History of Surgery, from the pen of Dr. John S. Billings. This section contains a history of the surgical art from the time of Egyptian surgery to that of the present day. On account of the immense amount of material there is necessarily an encyclopædic character imparted to certain of the work, but the full descriptions of the works and methods of the more important surgical writers, and the introduction of numerous descriptions of surgical procedures and quotations from the more interesting works, make the article very interesting reading. The description of the American surgeons is full and interesting and doubtless the most complete yet published. The section ends with a list of the prominent surgical journals.

The article on surgical pathology, by Dr. Councilman, is a clear and concise presentation of the subject. The chapter on inflammation is especially to be recommended ; it is well, though diagrammatically illustrated, and is a clear and up-to-date exposition of the subject. The article on tuberculosis and tubercle is also well worthy of attention.

Dr. Welch's article on the general bacteriology of surgical infections is well arranged and clearly written. It embodies the results of a large personal experience and an extensive knowledge of the literature. The article takes up the bacteria normally inhabiting the body which may be concerned in surgical diseases, their methods of introduction and elimination, and the processes which favor their growth and action in the body. An excellent summary of the leading bacteria of surgical infections and their biological properties concludes the article.

The section by Dr. Nancrede on symptoms, diagnosis and treatment of inflammation, abscess, ulcer and gangrene, contains besides an excellent article on wounds, an article on one of the newest surgical affections, traumatic hysteria. Why articles on diaconti-

asis and mycetoma should be introduced into this section we utterly fail to see.

Dr. Carmalt's article on septicæmia and pyæmia, Dr. Warren's on traumatic fever, erysipelas and tetanus, and Dr. Biggs' on hydrophobia, are all well written and satisfactory.

The article of Dr. Conner on gunshot wounds is an excellent one. It contains an excellent account of the effects caused by the modern forms of weapon with the new projectiles, with excellent illustrations, mostly from the article of Dr. LaGarde.

The article on fractures is by the Editor. It is well written and conservative, and contains a good many excellent illustrations from natural preparations. It also contains a good many illustrations of antique surgical appliances and refined instruments of torture, such as "Malgaigne's hooks," which had better have been left out of a text-book on modern surgery.

Dr. W. C. Wood's article on anæsthesia will well repay reading. It contains a full account of the theoretical bearings of the subject and many useful and important practical points.

Dr. Gerster's article on antiseptic and aseptic surgery is, as we should have expected, a thorough one. We are inclined to think, however, that a much more convenient and comfortable operating habit than a long apron and sabots could be found, without sacrificing cleanliness.

The volume closes with a good article on operative surgery, by Dr. Stephen Smith.

As a whole the volume is a decided success. It is well printed on good paper and the illustrations are well executed. We hope that the succeeding volumes will be as good as this one.

NOTICE.

THE MALARIAL FEVERS OF BALTIMORE.

An Analysis of the cases of Malarial Fever, with Special Reference to the Relations existing between different Forms of Plasmodium and different Types of Fever.

By William Sidney Thayer, M. D., and John Hewetson, M. D.,

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Forming part of (Vol. I. of the Hopkins Hospital Reports, Vol. V.)

Orders should be addressed to The Johns Hopkins Press, Baltimore, Md.

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BULLETIN

OF

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A CASE OF ANTHRAX SEPTICÆMIA IN A HUMAN BEING ASSOCIATED WITH ACUTE ANTHRAX ENDOCARDITIS AND PERITONITIS.

By George Blumer, M. D., *Assistant in Pathology*, and Hugh H. Young, M. D.

(*From the Pathological Laboratory of the Johns Hopkins University and Hospital.*)

The following case of the œdematous form of anthrax seems worthy of being recorded, on account of the rarity of this form of the disease in this country, and also because of certain other interesting features of the case, namely, acute peritonitis and endocarditis due to the bacillus anthracis. The case has already been briefly referred to by Dr. Flexner in the Johns Hopkins Hospital Bulletin for May-June, 1895.

C. B., aged 59, a native of Germany, and a laborer in a hair factory, came to the Johns Hopkins Hospital Dispensary on Saturday, May 11, 1895, complaining of the swelling of the lids of the right eye. His history was as follows :

Family History. His father and one brother died of some lung trouble, the exact nature of which he does not know; one brother died of cancer of the liver. The family history is otherwise negative.

Past History. He had the usual exanthems as a child. Denies venereal disease, and gives no history of secondary lues. Drinks one glass of beer daily. Does not use tobacco. Had typhoid as a young man, but since that time has always been strong and healthy. He has worked in a hair factory for thirteen years.

Present History. Two days ago, while working with South American hair, he scratched his right eye with his hand, as it was itching. The next morning he noticed that the eyelids were slightly swollen, and itchy, and by this morning they were so swollen that he came to the dispensary.

At the time of the visit the swelling was confined to the lids of the right eye, and was fairly sharply localized : it was œdematous in character, and quite boggy, the overlying skin appearing almost of a natural color. Two small incisions were made, one into each lid, and a small quantity of rather thin, whitish fluid, resembling diluted milk, was evacuated. Cultures upon agar-agar were made at this time, and two days later the tube inoculated showed a pure growth of an organism which resembled the bacillus anthracis, and which upon inoculation killed a mouse in 24 hours. Further tests proved it to be the anthrax bacillus.

The patient was admitted to the hospital on May 13, four days from the onset of the disease. The physician who attended him at his home, from Saturday until his admission on Monday, stated that his temperature had been subnormal during the entire period. On admission the patient com-

plained of nothing but slight pain beneath the right side of
the jaw; otherwise he felt perfectly comfortable. He had no
headache or malaise. His mind was perfectly clear. The
following note was made at this time:

Patient is in bed on his back. Temperature F. 102°.
Pulse 132 per minute, regular, volume fair, tension not
increased. Respirations 16 per minute, easy. Tongue has a
slight white coat. The mucous membranes are of a fair
color, not cyanosed.

Both eyes are closed by œdema. On the left side the swell-
ing is not nearly so marked as on the right, the lids being
distended by a moderately firm, watery œdema.

The lids of the right eye are much swollen, hard, and tense,
and the overlying skin is occupied by several vesicles, varying
in size from a pea to a bean, and filled with clear, yellowish
serum.

The eyes themselves appear uninvolved.

Over the whole of the right side of the face and neck, and
extending up onto the scalp, is a marked œdema of varying
consistency; immediately around the right eye it is very hard,
and covered by tense shiny skin; over the forehead, neck and
remainder of the face, as well as over the implicated scalp, it
is much less firm and can be easily pitted by pressure.

The œdema extends across to the left side of the forehead,
and occupies the neck as low down as the clavicle. On the
inside of the mouth, the right cheek is marked with the
imprints of the teeth, and has a yellow-gray sloughy appear-
ance.

The thorax is rather barrel-shaped, but expands well and
equally.

The lungs are hyper-resonant throughout on percussion; on
auscultation the breath-sounds are clear, but expiration is
prolonged.

The point of maximum cardiac impulse is neither visible
nor palpable. The heart-sounds are best heard in the fifth
intercostal space 3 cm. within the mammillary line. The
sounds are rather distant, but apparently clear. The area
of relative cardiac dullness is almost obliterated by lung
tympany.

The border of the liver is indistinctly felt just below the
costal margin.

The spleen cannot be palpated.

The abdomen is natural in appearance, but is universally
tender to the touch.

The shins are clean. There is no œdema.

The glands on the right side of the neck are moderately
enlarged, and tender. Their consistency cannot well be made
out, on account of the overlying œdema.

The glands elsewhere are not enlarged.

May 14, 10 a. m. The patient is much worse this morn-
ing. He has had several involuntary passages of urine and
fæces during the night. The mind is quite clear, and he
answers questions rationally. He complains a good deal of
cramp-like pains in the abdomen. The pains are situated in
the umbilical region, and are sharp and constant, with occa-
sional acute exacerbations, during which he has a desire to
defecate. The abdomen is extremely sensitive to pressure
this morning. The spleen cannot be palpated. The pulse at

the wrist is almost imperceptible and practically uncountable.
The heart-sounds are extremely distant and feeble.

The temperature has been subnormal since 4 a. m. this
morning and is now F. 97°.

The right eye is somewhat more swollen than it was yester-
day, and the œdema now occupies the whole of the scalp, and
has spread down the right side of the chest to the level of the
pectoral fold; it also occupies all the tissues overlying the
upper part of the sternum.

The patient gradually sank, and died quietly at 4 p. m. on
the 14th.

Before death the œdema had spread further over the left
cheek, and had also extended somewhat further down the
chest. The patient became very cyanotic before death.
There was no respiratory distress at any time. His mind was
perfectly clear to within fifteen minutes of his death.

On the morning of the 24th he had three loose watery
stools, of a grayish color, and apparently containing no blood.

The urine was passed involuntarily and could not be
examined.

Autopsy, May 15th, 18 hours after death, the body in the
meanwhile having been preserved on ice. Body 174 cm. long,
moderately well nourished, strongly built. Rigor mortis in
both extremities. The right eyelids are œdematous, closing
the eye; they are congested and glazed, and the epidermis is
peeling off. The whole right side of the face, below the eye, is
œdematous, and the œdema extends over the head and neck.
The left eye and left side of the face are less swollen. The
œdema is well marked anteriorly over the neck and clavicles,
and can be followed well down on the chest. On incising
the skin, above the clavicles, much clear serum-like fluid
escapes. The œdema extends beyond the median line to the
left, and is immediately evident after incision, extending to
the sternum. Subcutaneous fat is moderate in amount.

Peritoneum. The peritoneal cavity contains turbid fluid;
at least 2000 cc. of such fluid is present in the cavity.
The serosa is injected, its reflection lost, the vessels very
hyperæmic. Smaller and larger ecchymoses are seen beneath
the serous membrane. In the smaller omentum, in the region
of the pancreas, a large ecchymosis is seen.

In several situations along the small intestine the serosa is
very hyperæmic, or even hemorrhagic, over areas as large as
a silver quarter, and at these places the walls of the intestine
are bulged outwards. The tissues about the kidneys and
pancreas are translucent in appearance and very œdematous.

Mediastinum. On removing the sternum the mediastinal
tissues are swollen, œdematous, and contain gas bubbles. The
œdema of the mediastinal tissues can be traced downwards
from the neck, passing in with the cellular tissue below the
clavicle. Large gas bubbles or spaces occupy this tissue.

Lungs. Both lungs lie free in the pleural cavities. They
are both emphysematous, particularly in the upper lobes, and
along the anterior borders, which almost meet in the middle
line of the body, anteriorly.

The heart is nearly covered by lung.

On incision the two lungs present similar appearances.
They are œdematous and very hyperæmic, the œdema and

hyperæmia being particularly noticeable in the lower lobes. There is no actual consolidation.

Pericardium and *heart*. On incising the pericardium there is an escape of gas. No excess of fluid in the pericardial cavity. Both layers smooth and pale.

The heart is not enlarged; its cavities appear normal. The valves show no chronic change; the auriculo-ventricular orifices not perceptibly abnormal. Along the free edge of the mitral valve, and less along the aortic segment, are several small elevations, appearing to be quite recent vegetations, covered by small red clots. The aorta is quite smooth. The heart's flesh friable and pale.

Liver. The capsule is free from adhesions. Surface smooth. On section, dark in color, quite cloudy; consistency perhaps diminished.

Spleen. Free from adhesions; well up under the costal margin; moderately large; only moderately soft; red in color; pulp abundant.

Kidneys. Both alike. Capsule strips off easily. The organs are swollen, the surface almost uniformly congested, the congestion being still evident on section. Striæ are coarse. Glomeruli visible and red. Ureters normal.

Adrenals and *pancreas* appear normal.

Stomach. In the pyloric region there is in the mucous membrane a large, deeply congested area, measuring 8x6 cm. in extent. It is not clear that there is a false membrane over it, but some grayish-yellow material adheres to the surface.

Intestines. The duodenum is congested uniformly. Beginning in the jejunum, which is less congested, there occur at intervals small, elevated, deeply congested, or hemorrhagic foci. These are quite circumscribed, although the mucous membrane about them is congested. They average 2 mm. in width and project 1 mm. above the surface of the intestine; they do not seem to correspond with the lymphatic follicles. The serosa over them is often the deeply congested, bulged-out portion already described; this is, however, not exclusively the case. These foci are quite numerous in the jejunum, at least 15 being present in this part of the gut alone. At times, two or three were close together, though, as a rule, they were more separated. In the ileum they were also seen, in this situation perhaps a little more separated, but in all as many were present as in the jejunum. In connection with one of these areas in the ileum, what appeared to be a false membrane occurred. If a membrane, it was thin, and easily scraped away. Several of the nodules showed superficial ulceration. There was no relation detected to the lymphatic apparatus, and the nodes were less numerous near the ileo-cæcal valve. The large intestine shows no such localized foci, only a diffuse congestion.

Mesenteric glands were swollen, congested, hemorrhagic, and softened.

Brain and *cord* not examined.

Bladder contained a small amount of turbid urine: the mucous membrane appears normal.

BACTERIOLOGICAL EXAMINATION.

Cultures were made, at the time of the first visit to the dispensary, from the incision made into the upper lid. Cover-slips and cultures were made during life, from the serous fluid from one of the vesicles over the right eye, and also from the blood.

The cover-slips from both the vesicle and the blood showed large bacilli, occurring usually in chains, and morphologically resembling the bacillus anthracis.

The cultures taken on the first visit, and also those from the vesicles and blood, all showed large numbers of gray-white colonies.

Transplantations were made from these colonies, upon agar-agar, gelatine, bouillon, potato, and litmus milk, the resulting growths resembling in every particular the growth of bacillus anthracis; and cover-slips showing large bacilli similar to those obtained from the vesicle and blood.

A mouse inoculated subcutaneously with an oese of the original culture died 24 hours later with local œdema and swollen spleen, and the organism was found in abundance in its heart's blood and other organs. At the time of the autopsy cover-slips were made from the peritoneal fluid, heart's blood, œdematous fluid in the neck, spleen, kidneys and lungs. Typical anthrax bacilli were present in all these preparations, in the peritoneal fluid associated with pus cells.

Cultures from the heart's blood, spleen, peritoneum, liver, kidney and lung, all showed a pure culture of the bacillus anthracis.

Cover-slips and cultures from the urine were negative. At the time of the autopsy three mice were inoculated subcutaneously :

1. With one oese of blood from the heart.

2. With 2 oeses of urine (the surface of the bladder having first been sterilized).

3. With a small piece of tissue scraped from one of the intestinal nodules.

All three animals died within a short time of one another, about 24 hours later. Autopsies showed local œdema and swelling of the spleen, and cover-slips from the site of inoculation, and from the spleen, showed typical anthrax bacilli.

HISTOLOGICAL EXAMINATION.

Sections were made from the heart valve (including one of the fresh vegetations), from the lung, liver, kidney, spleen, stomach and intestine.

Heart valve. The valve itself appears to be normal, with the exception of an adherent triangular mass attached to one surface of it. This mass represents one of the small fresh vegetations. It is attached by its base, its apex lying free, the principal points of attachment being at the two angles. At its point of attachment the vegetation consists almost entirely of fibrin; the body of the mass contains, beside fibrin, granular material, red blood corpuscles, many polynuclear leucocytes, and a few cells of an epithelioid type. The polynuclears and epithelioid cells are not equally distributed throughout the mass, but in certain places there are fairly packed aggregations of cells.

The valve itself appears to be free from anthrax bacilli, these being limited to the vegetation. Here they are extremely numerous, much more so than in the blood, and are distributed throughout the mass, lying, perhaps, a little more

numerous in the cellular masses described above than elsewhere. The bacilli occur at times singly, but are generally in groups or long chains.

Lung. The lungs show a moderate degree of chronic interstitial pneumonia, with compensatory emphysema, and some congestion.

The anthrax bacilli are more numerous here than in any other organ; they occur in the blood-vessels of the alveolar walls in large numbers. None are to be seen in the alveoli themselves.

Liver. The liver shows some thickening of the capsule and a well marked interlobular cirrhosis. In places there is a marked increase in bile pigment in the cells. A few localized areas of extensive fatty degeneration, with fragmentation of nuclei are seen scattered through the organ.

The bacilli are not very numerous in the liver; when seen, they are in small groups between the cells, evidently in the blood-vessels.

Kidney. The surface of the kidney is covered by a slight exudate very similar to that obtained from the peritoneum. It consists mainly of red blood cells, but a few poly- and mononuclear elements are also present.

The organ shows here and there thinning and adhesion of the capsule with localized connective tissue formation. A few fibroid glomeruli are seen. The kidney cells are well preserved, as a rule, but in places, especially in the convoluted tubules, are swollen and granular.

The anthrax bacilli are present in moderate numbers; a few are seen in the exudate on the surface, and they are scattered throughout the organ, being most numerous in the glomerular vessels.

Spleen. The chief change in the spleen seems to lie in the accumulation of blood within its tissues; the amount of blood is very large, and is evidently largely responsible for the swelling of the organ. The number of polynuclear leucocytes in the organ is very evidently increased.

The bacilli are found throughout the organ, most abundantly in the Malpighian corpuscles; they appear to lie in the blood spaces.

Stomach. The changes here are rather sharply localized in the area situated in the pylorus, the gross appearance of which has been described. There is some slight necrosis of the outer layers of the mucosa all through the section, and a much more marked necrosis in the region of the local lesion.

The lesion consists in a sharply localized infiltration of the mucosa with anthrax bacilli. The bacilli forming this mass evidently originally came by means of the blood current, as deep in the mucosa two blood-vessels are seen, both of which show distinct breaks of continuity, with hemorrhage into the surrounding tissue. The mass of bacteria stretches continuously from these vessels, through the mucosa, to the mucous surface of the stomach, and consists of myriads of closely interwoven bacilli. The mass is not of even width from the surface to the depths, but spreads out widely in two places, one immediately beneath the mucous surface, and the other midway between the surface and the muscularis mucosa, thus forming two spreading masses connected with each other and

with the ruptured vessels by comparatively thin pedicles of bacteria.

The mucous membrane surrounding this mass is very necrotic, though there is but little reaction, only a few polynuclears being seen about the focus.

Intestines. In the diseased areas, described macroscopically, the intestinal wall is much thickened.

The surface epithelium in these areas is almost entirely destroyed, and in many instances the villi have also disappeared, their bases remaining on the level of the openings of the follicles of Lieberkühn. The denuded surface thus left is ragged, but is practically free from exudate of any description. The villi which remain show two distinct processes. A certain number of them show a markedly more cellular connective tissue than normal, the increase in cells being of the lymphoid variety, and perhaps being only apparent, as the tissue is much compressed from the dilatation of the central vessels.

Certain others of the villi show a necrotic appearance, their cellular elements being greatly reduced in number, the nuclei of the cells which remain staining poorly, and the mass of the affected villus having a hyaline appearance and staining sharply with the eosin. This necrotic process on the surface of the intestine is not confined to the mucosa immediately over the diseased foci, but is found on the surface of the intestine elsewhere.

The muscularis mucosa is seen as an indistinct line, the indistinctness being due to its infiltration by cells, most of them polynuclear leucocytes, which spread apart its fibres, and render its distinction from the submucosa difficult.

In places it is pushed up towards the mucous surface, by the much dilated blood-vessels of the submucosa; in places it is pushed down towards the submucosa by the dilated vessels in the mucous coat.

In the submucous coat the most marked changes are seen, these changes being responsible for most of the increase in thickness of the intestinal wall.

The blood-vessels are intensely dilated and full of blood, in which it is easy to see that an excess of polynuclear leucocytes exists. In places there has been actual rupture of the vessel-wall, with extravasation of blood into the surrounding tissues.

Surrounding the blood-vessels, and filling up the entire area between the muscularis mucosæ and the internal muscular coat, is a dense cellular mass, thickest at the centre of the diseased area, and gradually shading off at the periphery into approximately normal tissue. The return to normal is more rapid towards the peritoneal than towards the mucous surface.

The mass consists almost exclusively of leucocytes with polyform nuclei, as a rule, densely packed, but, in places, separated by masses of granular or fibrillar fibrin.

Towards the mucous surface of the intestine the cellular infiltration practically stops at the muscularis mucosa, this structure containing only a moderate number of leucocytes, and but a very few being found in the mucosa.

Passing towards the serous surface of the intestine, we find that the polynuclears have passed between the fibres of the

circular muscular coat, in places spreading these fibres widely apart by their accumulation, and have penetrated into and through the longitudinal coat, appearing in large numbers on the serous surface of the intestine.

The longitudinal coat contains, in places, large numbers of the pus cells.

Here and there, throughout the cellular mass in the submucous coat, are small areas of necrosis with nuclear fragmentation.

The cell infiltration in the submucous coat is, as a rule, diffuse, but in places it appears as small circumscribed nodules.

These nodules, under the low power, strongly resemble the normal lymphoid follicles of the intestine, the resemblance being made more striking by their situation in the submucous coat, and pushing up to, though not into the mucous coat. Under the high power, however, they are found to be made up of polynuclear leucocytes.

The nodules then are small, round or oval areas of cells situated about in the normal position of the lymphoid follicles, but having no relation whatever to these follicles, as their structure proves, and being in fact focal inflammatory lesions.

The collections of ganglion cells, both in the submucous coat, and between this coat and the internal muscular layer, are widely separated by the wandering in of polynuclear leucocytes between the cells.

The lymphatic vessels just beneath the muscularis mucosa are in places widely dilated, and crowded with bacilli.

In places on the peritoneal surface is an exudate composed of many red blood cells, a good many polynuclear leucocytes, a few mononuclear leucocytes, and fibrin.

The anthrax bacilli are found in all portions of the intestinal wall, though in greatest number in the submucosa.

The necrotic areas on the surface of the mucosa show very large numbers of bacteria; in the majority of instances, however, these do not appear to be anthrax bacilli, but a much shorter bacillus, though an occasional long bacillus resembling anthrax is seen.

In places, however, on the necrotic surface, masses of practically nothing else but anthrax bacilli are seen.

In the deeper parts of the mucosa, both the anthrax and shorter bacilli are seen, the anthrax bacilli being more numerous near the surface.

In the submucosa the bacilli are numerous; they are scattered throughout the inflammatory areas in small groups, and are found in large numbers in certain regions, viz.:

1. In or immediately beneath the muscularis mucosa in the form of a band of bacilli, closely woven, of about the normal thickness of the muscularis mucosa. Those immediately beneath the muscularis mucosa are evidently at times in the dilated lymphatics described above.

2. Along the borders of the blood-vessels of the submucosa, having a similar band-like formation, and being most numerous along the border of the vessel nearest to the mucosa.

3. At the junction of the longitudinal and circular muscular coats, in the form of a loose network.

The bacilli are found scattered through the circular muscular coat in fair numbers, often in quite large masses between the muscle fibres, and in these instances in the same areas where the polynuclears are abundant. The longitudinal muscular coat and the peritoneal exudate show a few bacilli, usually singly or in twos and threes.

REMARKS.

Clinically the case presents no very striking features. The œdematous form of anthrax is certainly rare in this country, but numerous cases have been reported elsewhere. That the infection took the œdematous form was probably due to its location, most cases of this variety occurring about the eyelids, presumably on account of the thinness of the skin and the loose character of the cellular tissue in this region.

Debrou[1] reported a very similar case in 1865, though in his case the intestinal lesions were not so far advanced as in ours, and there was no endocarditis present.

The occurrence of clinical symptoms, pointing to peritonitis and intestinal lesions, is worthy of note, as in a number of cases with extensive intestinal involvement no local symptoms at all were present.

Mahomed[2] and Haase[3] report such cases, whilst Verneuil[4] and Houel,[5] on the other hand, report cases similar to ours, with well marked abdominal symptoms.

The presence of abdominal symptoms may be of value in pointing out beginning intestinal involvement, as in a recent and interesting case reported by Schütte,[6] in which there were independent infections of the skin and intestinal tract at quite long intervals.

Schütte's case also illustrates the differences between primary and metastatic anthrax.

The patient was a butcher's apprentice, who assisted in killing a cow affected with anthrax.

Five days later there appeared on the upper lid of the right eye a carbuncle, the patient not complaining of abdominal symptoms until fourteen days afterwards.

At this time he had pain in the abdomen, constipation having preceded the pain for several days.

Death occurred on the 16th day after infection. Already at this time the malignant pustule had begun to disappear, but there was an extensive œdema over the face and neck, as well as of the mucous membrane at the entrance to the epiglottis. Moreover there was a typical anthrax "mycosis intestinalis," with hemorrhagic lymphadenitis of the mesenteric and retro-peritoneal lymph glands.

Although the spleen was not inconsiderably enlarged, anthrax bacilli could not be found, either in it or in the œdematous skin of the neck, neither could they be found in the neighborhood of the pustule, which was opened four hours post mortem; the staphylococcus and streptococcus were cultivated from the bloody fluid.

From the mesenteric lymph glands, in addition to colon bacilli, and streptococci, anthrax bacilli showing great virulence for mice were cultivated. These latter were found in large numbers in the peritoneal lesions, in the stomach and intestines, where the pustules occurred especially the largest one on the upper surface of the anterior stomach wall, extending probably to the muscular layers, causing progressively fewer and fewer bacilli from the mucosa outward.

They were never found in the blood-vessels, though in these

there were many streptococci, these being especially numerous in the spleen.

In this case we have to deal with a primary carbuncle of the skin, and also a primary intestinal infection. From the latter situation the lymph glands became infected through the lymphatics. Upon these first infections there was added later a general streptococcus infection through the blood current. How did the intestinal infection occur ?

It could not have occurred at the same time as the skin infection, inasmuch as fourteen days elapsed between the two. It could then only have occurred either in consequence of the scratching of the itching pustule by the patient himself (in which pustule, during life, anthrax bacilli had been demonstrated), the bacilli having thus been carried to the mouth ; or the original blood had become dried on his hands or some other part, and the spores had been carried by himself into the intestinal canal.

Our case evidently differed entirely from this, the intestinal affection being secondary to the local one, and taking place through the blood current; the clinical symptoms show that the intestinal lesions occurred within a day or two of the original lesion, and the pathological findings leave no doubt as to the part played by the blood-vessels.

The case is interesting from a pathological point of view on account of the endocarditis, the peritonitis, and the intestinal lesions.

Endocarditis due to the bacillus anthracis appears to be rare; we have only been able to find two cases reported, both of them by Eppinger.[7]

Our case differs from both of Eppinger's, in that we found a perfectly fresh endocarditis on a previously normal valve, whilst in both of his cases, though there was a fresh endocarditis, there was also evidence of old valvular disease, the latter of course probably not due to the anthrax bacillus. The fresh vegetations in Eppinger's cases, and ours, were, judging from his description, of similar formation, though apparently the anthrax bacilli were present in much smaller numbers in his cases.

In one of his cases the evidence goes to show that the endocardial infection was not conveyed, at any rate not entirely, by the heart's blood, but took place by means of infective emboli, occluding the newly formed vessels in the chronically diseased valve. As Eppinger points out, this process could not occur in a normal valve, which is free from blood-vessels,

and was only possible on account of the pathological vascularization brought about by the old endocarditis.

Actual peritonitis due to the anthrax bacillus would also seem to be rare.

In the cases of Mahomed,[2] Houel, and Waldeyer,[8] the peritoneal cavity contained large quantities of fluid of a serous character, but in none of these cases was fibrin present, though in Waldeyer's case the visceral peritoneum was injected and slightly cloudy. In none of the cases were the microscopical characters of the fluid ascertained.

In Krumbolz's[9] case fluid was also present, and though its microscopical characters are not mentioned, the anthrax bacillus was found in it, both in cover-slip and culture. It is quite possible that cultures and cover-slips would have shown the bacillus in all these cases, for in our case the fluid did not at all resemble pus, nor the ordinary serous peritoneal exudate, whilst the description of the fluid in the cases above mentioned would lead us to believe that it was probably similar in character. The intestinal lesions found in our case correspond very accurately, as far as the gross appearances are concerned, with those described by v. Recklinghausen,[10] v. Wahl,[11] Baumgarten[12] and others. We have been unable to find any minute microscopical description of these lesions, though in general characteristics the lesions seem to have corresponded fairly well with ours.

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A STUDY OF SUBCUTANEOUS FIBROID NODULES.

By T. B. Futcher, M. B.

During the last two years several patients have been admitted to the Johns Hopkins Hospital, in Professor Osler's service, in whom this interesting complication has been observed. Considering the comparative infrequency of the condition and the meagreness of the literature on the subject in the medical journals of this country, it seemed appropriate that these cases, together with a number derived from other sources, should be reported. Before doing so, however, a short review of the literature will be given.

Although our knowledge of subcutaneous fibroid nodules is for the most part recent, yet they had been observed at least as early as the latter part of the last century, when Sauvages [*] described them, though he did not note their association with rheumatism, the merit of which is ascribed by Jaccoud to Froriep. Froriep's observation was made in 1843, but there has been some doubt expressed as to whether or not what he described was the true subcutaneous fibroid nodule of rheumatism. Hillier[39][†] described them in 1868, whilst in 1871 Jaccoud[44] gave a very accurate and concise account of the nodules in his *Traité de Pathologie interne.* Meynet,[54] of Lyons, reported a case in 1875, one year after Barlow and Warner[3] observed the first case of their series. It is to the last mentioned writers that we are indebted for a good deal of our information concerning the subcutaneous nodules. They reported a series of 27 cases before the International Medical Congress held in London in 1881, and were the first to systematically study the nodules and draw definite conclusions from their observations. Since the report of their series, quite a number of cases have appeared in the literature, most of them, however, in British and French journals. In looking up the literature of the subject one would be led to suppose that subcutaneous fibroid nodules are a rare occurrence in this country, judging from the comparative infrequency with which cases have been reported in the medical journals. Dr. Osler[62] is of the opinion that rheumatism occurs much less frequently in Philadelphia and Baltimore than in London, and that subcutaneous fibroid nodules as a complication of rheumatism are a "great rarity" in these two cities. The first case reported in this country, so far as can be ascertained, was from Dr. Osler's clinic at the University Hospital, Philadelphia, by J. K. Mitchell[56] in December, 1888.

Cheadle[16] attributes the fact that the nodules are so often overlooked and so seldom described, to three reasons: (1) because they are rarely seen in adults, and that it is from adults that we take our ideas of rheumatism as a disease; (2) that they are not known of or looked for by the physician; (3) that they often escape notice by their smallness.

The nodules usually vary in size from a hempseed to a walnut. They are situated generally in the subcutaneous tissue, and as a rule are quite freely movable. Not infrequently they may be attached by their deep surface to the deep fascia, the sheaths of tendons and muscles, and occasionally to the periosteum. Sir Dyce Duckworth[24] is of the opinion that there are several different varieties of the nodules, and our observations would lead us to conclude that there are at least two distinct forms: (1) those which are comparatively small, extremely firm, distinctly rounded, and easily movable beneath the skin; (2) those which often grow larger, are softer in consistency, somewhat flattened and lobulated, and to which the skin occasionally is slightly adherent. The first class comprises the larger number of cases, and to it belongs the typical subcutaneous fibroid nodule. Those belonging to the second type appear to be of a fibro-lipomatous character, and seem to be less frequently associated with endocardial complications than do those of the first type. In certain cases both forms will be found associated in the same patient, as in cases V and VI of the present article.

Angel Money[59] claims that the subcutaneous tissue is not alone the only situation where rheumatic fibroid nodules are to be found. He holds that the heart muscle may be the seat of nodular masses similar in appearance and structure to those found in the subcutaneous tissue. He speaks of "nodular pericarditis" and "pericardial nodules," and considers the two conditions to be distinct. In an autopsy on a woman aged 20, the whole pericardial sac was found obliterated by fairly recent adhesions, and nothing nodular about the pericarditis could be detected. Three definitely sub-pericardial nodules were found, however, each about the size of a hempseed. Angel Money holds that they are the "true homologues of subcutaneous nodules and ought to be called sub-pericardial nodules."

The subcutaneous nodules may be found either in the neighborhood of joints, or, as is quite commonly the case, over the fleshy bellies of the muscles. The fingers, dorsal surfaces of the hands and feet, the vicinity of the olecranon and condyles of the humerus, the margins of the patella and neighborhood of the malleoli are the most common situations. Other less common situations are the superior curved line of the occipital bone, the temporal ridge and forehead, the vertebral and scapular spines, crest of the ilium and the fibrous structures of the intercostals. The skin over the nodules is usually freely movable and natural in color, although in certain instances it has been found somewhat thickened and reddened, and adherent to them as in Middleton's[58] case. When such a condition exists, it is supposed that friction has set up a certain amount of inflammation in the skin, resulting in its becoming adherent to the nodules. Rarely is there any pain complained of, but in some cases the nodules have been the seat of pain in damp weather, and they have been associated with slight itching, as in the last mentioned case. At times slight pain is complained of during the growth and disappearance of the nodules, as in Case VI.

It would appear that instead of the nodules occurring as

[*] Davaine is the authority for this statement (Ref. 21).

[†] See literature at the end of the article.

distinct localized swellings, there may be a diffuse thickening of the subcutaneous tissue as in Hershman's case, which was reported as "A Case of Progressive Enlargement of the Hands." As a proof that such a condition may possibly exist, this same patient had typical subcutaneous nodules about both elbows and over one patella, sections of one of these showing the general characteristics of the nodules, and there was in addition a distinct history of repeated attacks of rheumatism.

The nodules occur most frequently in children and young adults. Dr. Osler[61] has found them oftener in adults. In Barlow and Warner's series of 27 cases, 17 of whom were boys and 10 were girls, all the patients were under 19 years of age. Without being able to state positively, it would appear from the cases which have been reported, that females are affected oftener than males. The duration of the nodules varies very much. The shortest duration from the eruption to the disappearance of a single nodule in Barlow and Warner's cases was 3 days, and the longest 5 months. Sir Dyce Duckworth[21] reported two cases, in which in one instance the nodules lasted 18 months, and in the other 30 months. There may be only a single crop of the nodules, or, as is more commonly the case, a succession of crops, some nodules diminishing while others are increasing in size. They very rarely appear about joints that are acutely inflamed. Usually they make their appearance after the acute symptoms have subsided and the temperature has become normal. The onset of the nodules is not accompanied by a fresh rise in temperature.

In examining a patient for the presence of subcutaneous fibroid nodules, it is always necessary to make a very close examination of the body. If the nodules are quite small the patient himself will in all likelihood be ignorant of their presence, owing to the fact that in the majority of cases their growth is not associated with pain. An inspection of the body is therefore not sufficient; the neighborhood of the joints and the skin over the bellies of the muscles should be carefully palpated, as the nodules may be so small that their presence may be revealed only by this means.

Féréol and Davaine[21] have reported a number of cases of rheumatism, in which the skin and subcutaneous tissue presented small thickenings, which were due, not to a definite formation of fibrous tissue, but apparently to a localized œdema. These nodules rarely lasted longer than three days, and in many instances disappeared within 24 to 36 hours after their appearance. On account of their rapid onset and disappearance, and their association with rheumatism, they have been called by Féréol "nodosités cutanées éphémères chez les arthritiques." Some writers consider them to be quite distinct from the ordinary subcutaneous fibroid nodule, whilst others consider them allied, differing only in degree of development.

A number of very interesting cases have been reported in which subcutaneous fibroid nodules have been found associated with severe attacks of migraine. A case reported by J. Hobbs[61], of Bordeaux, is particularly interesting in this connection. The patient, a female, had for twelve years suffered from severe attacks of migraine, which were almost invariably associated with the onset of the menstrual periods, and on repeated occasions accompanied by the appearance of a subcutaneous nodule over the left frontal region. Upon the cessation of the menstrual flow the migraine and nodule disappeared. During one of the attacks the patient had quite an extensive crop of nodules over the forehead and scalp and about the right elbow. There was a distinct family history of rheumatism, and the patient's hands showed marked changes from chronic rheumatism. Davaine[21] reported three cases in which the onset of migraine was in each instance associated with the appearance of subcutaneous nodules over the frontal region. This condition is interesting as it seems to afford proof to the theory that migraine is sometimes rheumatic in origin, and the presence of the nodules would give a clue to the true cause of the migraine in cases where there was no apparent joint involvement.

Several instances have been recorded where subcutaneous nodules have been found in cases of osteo-arthritis. Newton Pitt[66] has reported several such cases, and states that the nodules have the same histological structure as those of rheumatism, although differing from them clinically in the following points: (1) they occur in adults; (2) they are much more chronic and last for years; (3) they are at times extremely painful and tender, the pain returning from time to time; (4) they are usually unassociated with any cardiac lesion; (5) they may vary in size from a small shot up to one inch in diameter, but they are generally larger than those of rheumatism. Payne[64] and Mahomed[52] have both observed the nodules in osteo-arthritis, the latter stating that they are not identical with those of rheumatism.

As regards the gross appearance of the nodules, Cheadle[16] says that "when they are exposed by dissection, they appear as oval, semi-transparent, fibrous bodies, like boiled sago grains." The accounts of microscopical examinations vary considerably, but agree in a general way in that the nodules appear to be made up essentially of fibrous tissue in various stages of development. The examination made by Barlow and Warner showed the nodules to be made up of a fibrous network, with caudate, spindle-shaped and nucleated cells and a large number of blood-vessels. They suggested that the appearance presented many of the characteristics of organizing granulation tissue. In a number of instances where microscopical examinations were made, the blood-vessels have been found markedly increased in number, and special stress has been laid on the changes in the blood-vessels themselves. In Middleton's case already mentioned, the nodules were made up largely of connective tissue in various stages of development. Blood-vessels were almost entirely absent from the centre of the nodules, but at their periphery the arteries were abnormally numerous, and in many instances their coats were thickened by an infiltration of cells, the tunica intima being frequently particularly affected. The middle coat was also considerably thickened and dissected by a collection of cells. Groups of these cells frequently extended to a considerable distance from the vessels, and in many instances they mapped out the course of the minute vessels in the papillæ of the skin. Middleton thought, on account of the marked changes in the blood-vessels, that the nodules might possibly be vascular in origin, as if produced by some irritant carried

in the blood. Cavafy[13] found a marked proliferation of the endothelial cells in many of the blood-vessels in addition to the changes in the vessel-wall noted above. The vascular changes are not always a feature, however. In J. K. Mitchell's[58] case the histological examination made by Dr. Osler showed "a dense fibrous stroma, with cells chiefly ovoid, the ends prolonged into fibrils. There was no such arrangement of round-celled elements, as in granulation tissue, which Barlow found in his specimens. The extreme toughness of the nodules indicates that they have undergone conversion into fibrous tissue. In teased specimens there were places in which the fibres were closely set together, as in embryonic connective tissue, but in the larger part very few cells could be seen among the wavy bundles of fibres."

The microscopical examination of the nodules from Case I of the present article (the full account of which will be given with the report of the case) showed several interesting features which, so far as can be ascertained, have not been previously noted. Briefly stated, these consisted of a definite hyaline degenerative change in the fibrous tissue in many places, whilst in other situations areas of calcareous degeneration were to be made out. The sections also showed the presence of giant cells and minute hemorrhages.

One of the most interesting features in regard to the nodules is that they disappear without leaving any apparent indication of their previous existence or situation. This seems remarkable, as definitely formed fibrous tissue, when once present, is not supposed to undergo absorption and disappearance. The same nodules may at various times undergo a diminution and increase in size. On account of the marked vascularity of the nodules this would be readily explained by a vaso-motor influence causing contraction or dilatation of the vessels.

Barlow and Warner stated that the nodules were in their nature probably homologous with the inflammatory exudations which form the vegetations on the cardiac valves. F. D. Drewitt[22] has suggested that they might be related in their origin as well as in their nature. In the case of the cardiac vegetations, they generally occur on the free margins of the cardiac valves, where they are constantly subjected to the friction of the blood current, and when the valves become inflamed, to friction on each other as well. Likewise, the nodules are most commonly found over the most prominent part of the joints, where they are most liable to be subjected to injury and friction. Dr. Drewitt brought forward further proof of his theory that friction may be a factor in the production of the nodules, or at least in determining the position where the nodules occur. He stated that if the nodules make their appearance in a patient with rheumatism, who is kept constantly in bed on his back, they will occur in greatest numbers over the occiput and the spinous processes of the vertebræ, situations in which, under ordinary circumstances, they rarely occur.

Subcutaneous fibroid nodules are considered by such authorities as Barlow and Warner and Cheadle as a positive indication of the existence of a rheumatic taint in the individual in whom they may be found. It would appear that rheumatic cases with endocardial complications seem to be most liable

to this interesting complication. This is borne out by the fact that in the majority of the cases which have been reported endocarditis has been present. A synopsis of Barlow and Warner's series of cases shows how grave the cases are in which the nodules occur. Of the 27 cases there was a distinct history of arthritis in 19, whilst 6 others had definite joint pains. In every case there was evidence of endocarditis, either mild or severe; pericarditis was present in 8 cases; in 10 there were definite choreiform movements, and 8 out of the 27 cases proved fatal. Cheadle holds that the presence of the nodules in a case of rheumatism is of very grave import, especially when they occur associated with definite signs of endocarditis, as he has found in his experience that the heart complication is "persistent, uncontrollable and marches almost infallibly to a fatal end" and is practically equivalent to signing the patient's death-warrant. He also maintains that the gravity of the case is in direct proportion to the number and size of the nodules. Other observers have noted the progressive character of the heart lesion in cases of rheumatism associated with subcutaneous nodules.

Edge[29] is of the opinion that cases in which the nodules occur without any associated endocarditis appear to be more common in adults than in children.

In some instances it has been noted that the heart murmur has diminished in intensity with the disappearance of the nodules. Whether or not this is of any practical importance is doubtful, as the intensity of the murmur bears no definite relationship to the gravity of the heart lesion.

C. H. Brown[12] reported a case which was particularly interesting, in that it was the first case reported in this country in which there was an association of rheumatism, chorea, endocarditis and subcutaneous fibroid nodules. Case II showed a similar combination, and as far as can be ascertained these are the only two such cases that have been reported in this country. Brown is of the opinion that cases of rheumatism which are associated with chorea are specially liable to the occurrence of subcutaneous fibroid nodules.

Fibroid nodules are rarely an accompaniment of acute rheumatism. They occur most commonly after the acute symptoms have subsided and their presence indicates that the rheumatism is very likely to run a chronic course, so that one should be guarded in his statements to the patient or his friends as to whether or not recovery will be rapid and complete.

Just as the nodules have been shown to be of some value from a prognostic standpoint, so in certain cases they may aid us in establishing a relationship between rheumatism and certain morbid conditions found in a patient. For instance, they were of great importance in arriving at the cause of the neuritis in Case VII. Not infrequently the nodules occur in patients without there being any evidence or history of pain or swelling of the joints. If we are to believe the statement of Barlow, Warner and others there is a presence of the nodules is an absolute indication of a rheumatic state, and their occurrence in cases of chorea and endocarditis without any joint involvement would seem the necessity to be considered these diseases had rheumatic . . .

There are several conditions which . . . the subcutaneous nodules of rheumatism:

1. Traumatic painful subcutaneous nodules. In this case there would likely be a history of traumatism; the nodules would be limited to possibly one or two in number and would be painful.

2. In the case of the ephemeral nodosites of Féréol, the true skin itself is involved; the nodules are not so hard and fibrous and disappear very suddenly.

3. Erythema nodosum might possibly be mistaken for the rheumatic nodules. In this condition the skin between the knee and ankle is usually the part involved. The thickening is in the true skin. The nodes are larger in diameter than the fibroid nodules usually are, the skin over the affected area is usually reddened and undergoes a series of changes in color. The affected areas in erythema nodosum are painful and tender to the touch.

4. Subcutaneous syphilitic gummata might at first present a somewhat striking resemblance, but in this condition the skin would soon become adherent to the mass, and the whole would present the characters of an inflammatory tumor. A possible history of lues and other evidences of syphilis would put one on his guard.

5. In cases where tophi are deep-seated about the joints, as they not infrequently are, there might be some difficulty in diagnosis. Where such are present, there would most likely be others present in the ears, showing the deposition of urate of soda. The history of the case would also give a clue to the true condition.

6. Urticarial wheals show a slight resemblance, but would be distinguished by the skin itself being involved, and the areas presenting a whitish centre surrounded by a reddish halo. Pruritus would be marked, and there would in all probability be a history of gastric disturbance.

7. Heberden's nodosites might be mistaken for the nodules. The former are limited to the sides of the distal phalanges, are hard and firmly united to the phalangeal bones of which they form a part.

8. A number of cases of subcutaneous nodules associated with syphilis have been reported. These do not appear to be gummatous in character, and present a striking resemblance to fibroid nodules of rheumatism. Careful inquiry should be made for a syphilitic history in all cases where nodules are present without any apparent joint complication. Cases of fibroid nodules in syphilis have been reported by Lailler,[46] Dr. Stephen Mackenzie,[50] Sir Dyce Duckworth,[26] and Dr. Kingston Fowler.[53a]

9. The fibroid nodules of osteo-arthritis are very similar to those of rheumatism, but Dr. Newton Pitt claims to be able to distinguish them by the points already given.

10. Certain benign growths, as lipomata and fibromata, might be mistaken for fibroid nodules. The lipomata are larger, softer and more lobulated than the nodules, and are situated most commonly over the back and shoulder-blades. More difficulty would be found with the fibromata, as the fibroid nodules are really of a fibromatous nature.

The nodules seem to have a life history of their own and appear to be uninfluenced by any special treatment. One should treat the disease of which they are only a symptom.

CASE I. — No history of rheumatism; enormous hypertrophy and dilatation of the heart; adherent pericardium; chronic proliferative peritonitis with ascites; subcutaneous fibroid nodules; no endocarditis.

Louisa R., aged (on admission) 13, an occupant of Ward G, with the exception of a few months at a time, from May 14, 1891, to December 8, 1894.

Father and mother are living and well; no rheumatism in the family.

The patient has had measles, scarlet fever, and whooping-cough; she has never had rheumatism or chorea. The mother is positive that there never has been any swelling or tenderness of the joints. Some time before admission to the hospital she had for a time pains in the muscles of the right arm.

Her illness began in the summer of 1891 with swelling of the feet and shortness of breath.

In the three years and a half during which she was under observation she had all the signs of enormous dilatation and hypertrophy of the heart; there was a loud, rough apex systolic murmur, and we regarded the case as one of extreme mitral insufficiency from disease of the valve, with secondary great enlargement of the right heart. She had a pulsating liver, which gradually shrank. The recurring ascites was attributed to proliferative peritonitis and perihepatitis, and it was thought probable that she had adherent pericardium.

She never at any time had swelling of the joints; for the past eighteen months she had extreme and persistent cyanosis of the arms and legs.

About two years before her death we noticed for the first time the presence of subcutaneous fibroid nodules. They were most numerous about the elbows and along the margin of the ulnæ. A few were also noticed about the wrists and over the ankles. The majority of them were small and shotty, though one or two about the elbows were larger and broader. They never were at any time painful; a majority of them were very persistent, but one or two of these about the elbow disappeared.

This case is of a good deal of interest, as the presence of the subcutaneous fibroid nodules, even in the absence of a rheumatic history, rather tended to corroborate our view that she had disease of the mitral valve segments.

The autopsy showed colossal enlargement of the heart, which occupied nearly the whole of the front of the chest. The pericardium was adherent, particularly over the right chambers. The cardiac orifices were enormously dilated, but the valves themselves, beyond a trivial thickening, were not involved.

On microscopical examination the nodules are seen to be made up essentially of fibrous tissue in various stages of development. The older portions consist of a rather dense fibrous connective tissue in which the fibres are arranged in bundles running parallel to each other. Other portions are composed largely of cellular elements, which under a high power are seen to consist of small round cells, fibroblasts and polynuclear leucocytes. In these situations blood-vessels are quite numerous, so that to a certain extent there is a resemblance to granulation tissue, as Barlow and Warner noted in their specimens. Several giant cells were present in the younger portions of the nodules, twenty-six nuclei being counted in one of these. The transition from the young portions to the well developed fibrous tissue is quite gradual.

Some of the sections show a very interesting feature in the occurrence of a definite hyaline degeneration of the fibrous tissue in certain situations. Where this degenerative change is most marked, the fibrous tissue appears to be arranged in bundles with a concentric distribution of the fibres, so that when the bundles are cut transversely they appear to be made up of a series of concentric rings. This hyaline degeneration also occurs, though to a less marked degree, in situations where there is not this special arrangement of the fibres. A further interesting feature is the occurrence of a distinct calcified change in these areas of hyaline degeneration at certain points. Portions of the fibrous tissue which have

undergone hyaline change show quite marked cellular infiltration, which, however, is almost entirely absent in the areas of calcification. The calcareous deposit appears to take place between the layers of fibres which have undergone hyaline change.

The vascularity of the nodules is quite a striking feature. The blood-vessels are most numerous at the periphery of the nodules, the central portions being comparatively free, excepting in the areas of cellular infiltration where minute blood-vessels are present. Some of the larger vessels show an infiltration of small round cells into their walls, these, in certain instances, extending some distance into the surrounding tissue. Many of the blood-vessels contained an excess of polynuclear leucocytes, which in some cases almost fill the vessel ; other vessels are occluded with plugs of fibrin. In one or two instances there is a distinct proliferation of the endothelial cells, the lumen of the vessel being almost filled with the proliferated and desquamated cells.

Minute hemorrhages into the connective tissue are seen in several situations.

The nodules are for the most part quite circumscribed, although cellular infiltration into the surrounding connective tissue does occur to a greater or less extent.

CASE II.—*Rheumatism, chorea, endocarditis and subcutaneous fibroid nodules.*

F. F., male, æt. 16, was admitted to the Johns Hopkins Hospital in Dr. Osler's service, June 29, 1894, complaining of pains in the wrist joints and nervousness.

The family history was unimportant ; no history of rheumatism in any member of the family.

The patient had measles, chicken-pox, mumps and diphtheria when a child. There was no history of his having had scarlet fever. From childhood up to the onset of the illness for which the patient was admitted to the hospital he had always had good health. Used tobacco and stimulants moderately ; denied having had gonorrhœa or syphilis.

The patient's illness began 10 weeks previous to admission to the hospital with sudden swelling of the right ankle-joint, which was also very tender to the touch. Skin over the joint was reddened. During the first week of the illness almost all the large joints became affected, the ankles, wrists, left tempero-maxillary joint, knees and hips being involved in the order named. All these joints were swollen and painful, so that during the second week he was unable to move in bed. Improved gradually during the third week, and at the end of the fourth week patient was able to get up. Since then patient had several relapses, having had to go to bed for one week.

Five days previous to admission, patient began to have involuntary movements of the arms, legs and tongue, which, however, were not so severe as to prevent his getting about. Two days previous to admission, however, the movements of the arms became very violent and uncontrollable, and those of his tongue interfered very much with his talking. Deglutition was not interfered with. There were slight spasmodic movements of the facial muscles, but the patient could not say how long they had been present.

No symptoms specially referable to the heart were complained of.

An examination of the patient on admission, showed but slight evidences of rheumatism, all the joints being moved quite freely without causing much pain. Complained of slight pain in the metacarpo-phalangeal and phalangeal joints of both hands, which were slightly tender on palpation.

The backs of both hands showed numerous subcutaneous fibroid nodules, particularly in the neighborhood of the metacarpo-phalangeal joints, about each one of which there were from four to five nodules. The nodules were present also about the phalangeal joints, but in smaller numbers. The wrists were free, but there were several nodules about the elbow-joints, chiefly over the olecranon processes and condyles. No nodules were to be found on any other part of the body. The nodules varied in size from a pin's head to a split pea, the skin being freely movable over them and not red-

dened. Those over the metacarpo-phalangeal joints were best seen by tightly closing the hands.

The patient exhibited slight, but definite choreiform movements in the arms and hands, with occasional twitchings of the leg and facial muscles.

The lungs were clear throughout on percussion and auscultation.

The point of maximum cardiac impulse was best seen in the fourth space in mammillary line. No thrill was to be made out. Relative cardiac dulness began at the third rib ; extended transversely from the left sternal margin to a point 2 cm. outside the nipple line. At the point of maximum cardiac impulse there was a rough systolic murmur to be heard, this being also well heard along the left border of the sternum.

The examination of the urine showed it to be practically normal, although at a subsequent examination a faint trace of albumen and a few granular casts were found.

The general condition of the patient while in the hospital improved markedly. The examination of the patient on August 15th, the day on which the patient left the hospital, showed that the choreic movements had practically ceased and the joints had entirely cleared up. An occasional nodule could still be made out on the backs of the hands and there was one still to be seen over the right elbow.

The examination of the heart showed that it had undergone a definite change. The point of maximum impulse was now in the fourth space 2 cm. outside the mammillary line. Relative dulness began at the second rib. The first sound at the apex was sharp and snapping, and was followed by a slight systolic whiff, traceable into the axilla. There was now a short presystolic murmur audible at the apex. A slight, soft systolic murmur was to be heard over the base of the heart and a systolic puff over the vessels of the neck.

The thyroid gland was distinctly enlarged, the right side being a trifle larger. Eyes were not particularly prominent. The usual range of the pulse was between 108 and 128.

The highest temperature at any time during his stay in the hospital was 101°, and it had been normal for 3 days previous to his discharge.

The treatment was rest with ol. gaultheriæ and liquor arsenicalis in increasing doses. Patient was taking 20 minims of Fowler's solution 3 times a day previous to his leaving the hospital.

The above case is interesting in that it shows the very unusual association of rheumatism, chorea, endocarditis and subcutaneous fibroid nodules in the same patient. It was also interesting on account of its showing that the cardiac changes were progressive, the heart increasing definitely in size and the murmurs changing in character. An effort has been made to try and find out the patient's present condition, but we were unable to get any information with regard to him. So far as can be ascertained, the only other similar case reported in this country was that of C. H. Brown. Mackay reported a similar case in the *Lancet*, the patient making an excellent recovery.

CASE III.—*Rheumatism, a....... .... subcutaneous fibroid nodules.*

P. H. D., colored, male, æt. 49, was admitted to the Johns Hopkins Hospital, in Dr. Osler's service, November 22, 1894, complaining of pain in the left side and shortness of breath.

The family history was unimportant, no hereditary ...... in the family.

There was no history obtainable of the patient having had any of the diseases of childhood. Had small-pox when ... and facial erysipelas when he was ... years of age. There was no history whatever of rheumatism previous to three years since a in ...., when patient began to complain of severe pain in the fore part of

the left foot, which was excessively tender and considerably swollen. Confined to bed two weeks. No other joint involvement. Had gonorrhœa when 39; no history of the initial lesion or any secondary symptoms of syphilis obtainable.

Eight years ago, five years previous to the "rheumatic" attack, patient noticed in front of his right knee a small lump which felt like a shot under the skin. Four or five months later a similar lump appeared over the front of the left knee, and subsequently one appeared over the right and left elbows in the order named. The nodules made their appearance without any apparent cause. They felt to the patient like "bird-shot" beneath the skin, were always freely movable, and at no time painful. Their size had gradually increased until one year previous to admission, since when they had remained stationary. Patient never knew them to diminish in size and increase again. He had never seen similar lumps on any other part of the body.

The symptoms of which the patient complained, on admission to the hospital, began three weeks previously, with pain of a constant aching character in the lower part of the left side of the chest. Occasionally the pain was sharp and shot up towards the left shoulder, but never down the arm. It was worse on exertion and deep breathing. Patient had had dyspnœa for four or five days, and occasional attacks of palpitation and vertigo. No histor of œdema of the feet. Appetite good; bowels regular.

An examination of the patient, on admission, showed him to be a well formed, well developed man. There was marked pulsation of the carotids and subclavians, and that of the radials was visible. Radial pulse was 76 to minute, regular in force and rhythm, good volume, and somewhat collapsing in character, though not typically so.

On the left elbow there were two large, subcutaneous, movable, lobulated nodules, the larger, 3x4 cm., being situated just behind the internal condyle, the smaller, 2.5x2.5 cm., just below the tip of the olecranon. On the right elbow, just below the tip of the olecranon, there was a still larger nodule, measuring 4x5 cm., and just by the side of this a smaller one, not larger than a split pea. On both knees, just below the patella, were similar nodules, the one on the left side being 3x3 cm., that on the right being a trifle larger and consisting of an agglomeration of smaller ones. These nodules were all moderately firm. They had never been painful and were not tender on palpation.

Lungs were clear throughout on percussion and auscultation.

The examination of the heart showed rather interesting changes. The point of maximum cardiac impulse was in the fifth space, 1 cm. outside the mammillary and 11 cm. from the midsternal line. Relative dulness began at the fourth rib, extended transversely from the left sternal margin obliquely outwards to the point of maximum impulse. At the point of maximum impulse the first sound was dull, preceded by a very faint rumble, and followed by a slight systolic murmur, which was lost 4 cm. outside the point of maximum impulse. Second sound quite sharp. Immediately inside and above the point of maximum impulse the first sound was preceded by a distinct presystolic rolling sound, which was heard over a very small area. Passing inwards and upwards from this point the sounds were represented by a double murmur, a systolic and a diastolic, the latter being best heard along the left border of the sternum and in the aortic area. In the second right interspace the sounds were quite loud, the first being represented by a harsh systolic murmur, the second by a well marked, somewhat accentuated second sound, followed by a slight murmur.

The further physical examination of the patient revealed nothing of importance, with the exception of a symmetrical enlargement of the parotid glands.

On December 23 it was noted that the radial pulse had become distinctly collapsing in character.

On January 24, 1895, there was noticed for the first time a pronounced throbbing over the second costal cartilage and interspace on the right side close to the sternum. This was both visible and

palpable. Percussion note was slightly dull over this area. The double murmur was still audible as on admission. Tracheal tugging was just to be made out.

An examination of the patient on February 8, 1895, revealed a striking difference in the volume of the two radial pulses, the right being much smaller than the left. There was no inequality of the pupils. The pulsation above noted had extended upwards, and on this date there was a distinct lifting of the inner end of the right clavicle and the sterno-clavicular articulation with each heart beat. This pulsation was most marked in the recumbent posture, almost disappearing when the patient sat upright. It seemed to be less marked over the second right cartilage and interspace where it was first noted. No thrill was to be made out over the pulsation, but a distinct thrill was to be felt over the vessels of the neck.

About two weeks later, February 26, the patient became very hoarse and cough was very distressing. Large quantities of ropy, tenacious sputum were expectorated. Microscopical examination of the sputum on this and subsequent occasions failed to show the presence of tubercle bacilli. For the first time it was noted that there was an inequality of the pupils, the right being larger than the left. Patient had been passing a diminished amount of urine, which contained a distinct trace of albumen and numerous hyaline and finely granular casts. The lifting of the right clavicle did not seem so marked as on previous examinations. The double murmur was to be heard as before.

From this date on the patient's general condition seemed to be gradually getting worse. He suffered intensely from severe attacks of dyspnœa and palpitation of the heart. A laryngoscopic examination by Dr. Warfield on March 8th showed a complete paralysis of the left aryteno-epiglottic fold, although the cords did not seem to be affected. The attacks of dyspnœa and palpitation gradually became more severe, and face became swollen, particularly on the right side.

The subcutaneous nodules were much the same as on admission, being possibly a trifle smaller. There had been no appearance of any fresh nodules on any part of the body. Patient did not have any evidences of arthritis while in the hospital.

On March 14 the patient became unconscious and died at 9.30 p. m.

Post-mortem. Only the most important parts of the post-mortem examination will be given. The heart and aorta showed very interesting changes. The heart was both hypertrophied and dilated; both ventricles were involved, particularly the left. Left ventricle averaged 19 mm. in thickness and was 9 cm. in length. Average thickness of right ventricle was 4 mm., the length being 9 cm. Mitral orifice measured 10 cm. in circumference, and the mitral valve appeared quite normal. Tricuspid orifice measured 12.5 cm. in circumference; valves were normal. Pulmonary valves were normal. Both auricular appendages contained recent thrombi. The aortic valves were thickened and retracted at their margins. The aorta measured 8 cm. in circumference just above the valve. There was a diffuse dilatation of the ascending and transverse portions of the arch of the aorta. The circumference of the aorta, at the origin of the innominate, was 10 cm. At the beginning of the thoracic aorta there was a farther dilatation which extended for a distance of 17 cm. It extended backwards and to the left, was spindle-shaped and involved all the coats. The central part of the dilatation was covered with light, adherent, laminated fibrin. This dilatation measured 12 cm. in circumference at the beginning, 13 cm. at the widest part, and 8 5 cm. at its inferior extremity. It was adherent to the fourth and fifth dorsal vertebræ, the bodies of which were eroded by pressure. The aorta was the seat of extensive nodular endarteritis. There were adhesions between the pericardial sac and the aorta.

Both lungs were partially bound down by old adhesions.

Kidneys showed marked chronic diffuse nephritis.

The left pneumogastric and recurrent laryngeal nerve were pressed on by a calcified pigmented gland.

Unfortunately no specimens of the nodules were obtained at the

autopsy, so that a report of the microscopical examination of these cannot be given.

The above case is interesting on account of the long duration of the nodules—8 years, and from the fact that they appeared 5 years before the patient had had an attack of rheumatism. The heart and aortic changes were interesting, as the aneurysmal dilatation practically took place while the patient was under observation in the hospital wards.

CASE IV.—*Rheumatism and subcutaneous fibroid nodules without endocarditis.*

J. B. T., male, æt. 28, a hospital employee, was admitted to the Johns Hopkins Hospital, Dr. Osler's service, June 24, 1895, complaining of pains throughout the body, vomiting, diarrhœa and sore throat.

Father was living at 68 years of age and had always been subject to attacks of rheumatism from childhood up. After a rheumatic attack when 20 years old he had numerous nodules appear beneath the skin of the arms and legs, some of which the patient states have persisted up to the present time. According to the patient's statement, these nodules would increase in size during an attack of rheumatism and diminish again afterwards. Could not say whether his father had crops to appear and disappear. Most of the nodules were the size of hazel-nuts but were never painful. Patient's paternal grandfather was disabled for 22 years as the result of repeated rheumatic attacks. A paternal aunt was subject to rheumatism, and a second died of apoplexy.

Patient had had measles, chicken-pox and mumps. When 14 years old he had a severe attack of pain in the lumbar region of the vertebral column, and also in the muscles on each side and over the shoulder-blades. Was confined to the house for 2 weeks, and had to be propped up in a chair. It was 6 to 8 months before he was able to get about properly, and since then he has never been able to do much stooping without causing pain in the back. About the time of this attack the patient noticed a lump about the size of a hazel-nut on the dorsal surface of the right forearm about 3 inches above the wrist joint, and a similar one on the palmar surface of the left forearm about the same distance from the wrist. These have persisted up to the present time, never having entirely disappeared. During an attack of pain in the joints, the nodules would become larger and harder and afterwards diminish in size again. Since the attack of pain in the back when 14, patient has had repeated attacks of pain in nearly all the larger joints of the body, which, however, have never been swollen. Has had nodules appear and disappear during these attacks. Two years ago patient had a severe attack of pain in the left ankle, which prevented him from working for 3 or 4 months. Joint was not swollen. During this attack the patient noticed several nodules appear on the front and outer aspect of the left thigh, and two between the crest of the ilium and the left costal margin. Three of these on the thigh and the two last mentioned ones have persisted to the present time. Several mild attacks of pain in the joints have occurred since two years ago, and several nodules have appeared and disappeared since then.

Had an attack of dysentery when 19, which lasted one year; malaria when 18; pneumonia 3 years ago. No history obtainable of gonorrhœa or syphilis. Never had chorea or palpitation of the heart.

The symptoms of which the patient complained on admission began five days previously with pains in the elbow, shoulder, knee and ankle-joints, and pain in the back. Pain was severe, and he had a stabbing pain beneath the right shoulder-blade. Soon after the joint pains began his throat became slightly sore. These symptoms continued up to the time of admission, previous to which for 24 hours he had had nausea, vomiting and diarrhœa, which he attributed to an indiscretion in diet.

The patient was a large framed, healthy-looking man. Pulse was 100 to the minute, regular, good volume; vessel wall not thick-

ened. Throat was slightly reddened, but tonsils were not swollen. Joints were all slightly painful, but not swollen. The following were the situations of the nodules:

Right arm: 1 on the outer side of the arm 8 cm. above the external condyle, 2 on the anterior aspect of the forearm over the flexor muscles, and 2 on the posterior surface over the extensors. These varied in size from 1 to 2 cm. in diameter, were strictly subcutaneous and movable, moderately firm, somewhat flattened and not tender.

Left arm: 1 nodule, 1x1.5 cm., about 4 cm. above the wrist on anterior surface of forearm. It was subcutaneous, movable on the deep structures, rather firm and flattened. This was in all probability the one which had been present since the onset of the rheumatism when patient was 14.

Left thigh: There were 4 nodules on the outer and anterior aspect of the middle third of the thigh, all of which measured 2x2 cm., and one of which was rather tender on palpation.

About midway between the iliac crest and the left costal margin there were two separate nodules, which were rather deep and measured 3x3 cm. They were rather deep-seated and somewhat tender. Skin was less freely movable over them than in the other instances.

Lungs were a trifle hyper-resonant on percussion. Few fine, moist râles heard in right axillary region.

The point of maximum cardiac impulse was neither visible nor palpable. Heart-sounds best heard in 4th space, 3 cm. inside the mammillary line. The relative dulness did not begin until the 4th rib was reached. The heart-sounds were clear at apex and base, and of normal intensity. No murmurs were to be made out.

Physical examination was otherwise also negative.

The long standing of the nodules, some having lasted 15 years and others 2 years, the occurrence of nodules in the patient's father, and the absence of any cardiac lesion, makes the case an interesting one.

CASE V.—*Rheumatic history, subcutaneous fibroid nodules and doubtful carcinoma of the stomach.*

Mr. U., æt. 57 years, was admitted to the Johns Hopkins Hospital, June 21, 1895, complaining of general weakness and nausea.

There was a distinct history of tuberculosis in the family, his father and two sisters having died of it. No history of rheumatism or malignant disease in the family.

When a child the patient had measles, whooping-cough and mumps. Gave a doubtful history of his having had typhoid at the age of 27. After this attack of fever he had diarrhœa each spring for 6 or 7 successive years. Had gonorrhœa when 21, but there was no history of lues obtainable. He had had frequency of micturition at night for 3 or 4 years. Two years previous to admission he had a mild attack of rheumatism in the ankles. There was no history of chronic stomach trouble. Used tobacco and alcohol in moderation.

The illness for which the patient came to the hospital began four months previously with severe pains in the shoulders, arms and, to a less extent, in the knees. The joints were apparently not swollen. During the attack of illness severe ... and ... not specially associated with the taking of food. He did not vomit any blood. His appetite was poor and nausea was constant, being increased by the sight of food. Flatulence was a prominent symptom. Had not had any pain in the epigastrium. Was gradually losing flesh.

The patient was not aware of the presence of any lumps beneath the skin.

He was rather pale and somewhat emaciated.

In the parasternal line, about 5 cm. below the costal margin, a small ...

and felt. They were freely movable and the skin was not adherent to them. Along the outer margin of the right tibialis anticus tendon there was a very hard subcutaneous fibroid nodule, and another occupied a corresponding position on the left foot.

The heart and lungs were clear throughout.

An Ewald's test-breakfast was given on two occasions, the contents of the stomach when removed showing an absence of free hydrochloric acid on each occasion. There was no reaction for lactic acid, however.

After inflation of the stomach the lower margin did not pass a point 4 cm. above the umbilicus. A slight sense of induration was to be felt in the left parasternal line, which was not to be made out when the stomach was empty.

The patient lost considerably in weight while he remained in the hospital.

In the above case we have the two forms of the nodules present in the same patient, the soft, flat, comparatively large fibro-lipomatous form, and the small, round, very firm variety.

Case VI.—*Rheumatism, subcutaneous fibroid nodules, with cardiac hypertrophy.*

The following case was shown by Dr. Toulmin (now of Philadelphia), at the Hospital Medical Society when he was a resident medical officer in the medical service. The case was not reported, and I am indebted to Dr. Toulmin and Dr. Hobach for finding the address of the patient and permitting me to examine him.

Mr. G., æt. 55, was seen at his own house.

There was nothing of importance in the family history. The patient had whooping-cough and mumps when a child. When 22 years of age he had his first attack of rheumatism; both ankles and right hip joint were affected, being very painful, but not swollen. He was laid up for two months, but did not have any subcutaneous nodules at that time. From then until eight years ago he had several mild attacks of rheumatism. Patient had not complained of any heart symptoms up to this time. Eight years ago he had a right-sided hemiplegia, speech being affected, which lasted three- months. Does not remember whether he had any joint involvement at that time or not. It was during this illness that the patient first noticed the presence of lumps beneath the skin on various parts of the body. His physician counted as many as 140 at this time. Quite a number of these occurred over the epigastrium, and the patient states that the one which is still to be seen and felt in this region first appeared at that time. Some of the lumps were as large as walnuts, were all freely movable, and were painful when they were growing or diminishing in size. Other situations where the nodules appeared at that time were: one on the left under eyelid; several painful ones on the scalp and on the back of the neck at the junction of the cervical and dorsal regions; others were present on the anterior surfaces of the arms, forearms, thighs and legs. The patient states that in all the last mentioned situations the nodules varied in size between a pea and a hazel-nut, most of them disappearing within 24 hours, and none lasting longer than three days.

Since eight years ago the patient has had repeated crops of nodules, at no time being perfectly free from them.

In October, 1892, he had a second attack of right-sided hemiplegia which laid him up eleven weeks. Again he had a profuse crop of nodules. The right ankle joint was swollen and painful, and he suffered from dyspnœa and slight precordial pain. Since then he has not had any further joint trouble, and has always been able to attend to his work.

The patient was a healthy looking, fairly well nourished man. Pulse was 92 to min., regular, good volume, vessel wall a trifle thickened. Subcutaneous nodules were present in the following situations: one beneath the costal margin in the left hypochondrial region, 3 x 3 cm., soft, somewhat lobulated and rather sensitive on palpation. This was of a fibro-lipomatous nature.

Right arm: One in front of internal condyle .5 x 1 cm.; five on the anterior surface of forearm, varying in size from a bean to a hazel-nut.

Left arm : One about the size of a hazel-nut above the external condyle on the outer side of the arm ; four on the ulnar side of the forearm, also varying in size between a bean and a hazel-nut. All the above were rather flat and not extremely hard.

Right leg : Two over the extensor tendons on the dorsum of the foot, and one apparently in the skin about 4 cm. above the ankle. These were in size between a pea and a bean.

Left leg : One about the size of a bean on the inner surface of the tibia about 11 cm. above the ankle. It was very hard, round, quite movable, subcutaneous, and extremely sensitive to the touch. Excepting for the tenderness it presented all the characters of a subcutaneous fibroid nodule. The patient had been forced for years to wear boots, owing to the pain in the nodules produced by wearing laced shoes.

The Lungs. Hyper-resonant on percussion, but otherwise were clear.

The Heart. The point of maximum cardiac impulse was in the sixth space, 1 cm. inside the mammillary line. The relative cardiac dulness began at the third rib and extended from the left sternal margin obliquely outwards to the point of maximum impulse. The first sound at the apex was distinctly prolonged and softened, but there was no definite murmur to be made out. Passing upwards along the left border of the sternum, a very faint systolic murmur was to be heard, the murmur being of maximum intensity over the pulmonary area. Both aortic sounds were quite clear.

This, like the preceding case, shows the association of the two varieties of subcutaneous nodules in the same patient.

Case VII.—*Rheumatic neuritis with subcutaneous nodules.*

I am indebted to Dr. Osler for the notes of the following interesting case :

Mr. H., aged 60, seen with Dr. Lockwood, July 1, 1895, complaining of pains in the arms and legs.

Patient is a tall, spare man, who has always enjoyed good health with the exception of dyspepsia, to which he has been subject at intervals for many years. He has taken very good care of himself, is a moderate drinker, and has an excellent family history ; no gout ; no rheumatism.

Early in March of this year he began to feel pain in the right leg, chiefly about the ankle and instep. It was as though he had a band about these places. The pain was sharp, but never very acute. He has felt at times a little numbness and tingling, and on several occasions there was a little redness of the skin about the ankle. Shortly afterwards the left leg became affected in the same way and the pain in the ankle was sharp. In it he had one day very sharp, stabbing pains down the back of the leg. He describes here, too, the same feelings as if there was a band about the ankle. Patient still experiences this sensation at times. There was no swelling, no special numbness, no enlargement of the joints. It was confined altogether to the legs. It did not incapacitate him in any way, but it was a source of a good deal of annoyance and distress. About two months ago the arms began to be affected. Ill-defined pains from the shoulder, without anything to be seen or localized, but with a good deal of tenderness, particularly of the muscles, when he laid the arm on anything. He does not seem to have had any paraesthesiæ. The muscular power of the arms has been perfectly good. The chief distress really has been in soreness on pressure ; thus, yesterday there was so much distress in the arms that to get relief he had to sit with them stretched out on pillows. Early in the attack he noticed the presence of certain nodules on the legs and arms which would appear and disappear. Most of these have now gone except the ones which I describe below.

On the skin, one-third from the elbow of the right arm just along the margin of the ulna, there is a small subcutaneous fibroid

nodule, very superficial and very distinct. There have been others which have disappeared. There is no thickening of the ulnar nerve; there are no trophic changes, no trace of sensitiveness in the muscles themselves, though there is much pain when the arm is resting in a certain position. The blood-vessels are not specially thickened. There is no soreness along the musculo-spiral nerve, no actual soreness on pressure on the muscles. On several occasions there has been a little redness. One of these small nodules was on the edge of the left tibia, but has disappeared entirely. There is no atrophy of the muscles in the arms or legs; a little tenderness along some of the cords of the brachial. Knee-jerks are present; perhaps a little plus. Pupils are of medium size, react well to light. No swelling of the joints; no tophi in the ears; he never ha had gout.

July 8, 1895.—He has not been so well. Has had much soreness, particularly in the arms and about the left wrist, where there has been subcutaneous redness and swelling. There was also tenderness. There is now on the extensor surface of the left arm midway between the elbow and wrist, a raised red region about 3x2 inches. The redness looks fading, but it is distinctly puffy. There was a patch similar to this, but horizontal, which was on both ankles at the early period of the disease.

The subcutaneous fibroid nodule on the right arm has disappeared. There is one now on the inner surface of the left knee. This feels like a small shotty body beneath the skin. It was a little sensitive. There is another small nodule just on the inner surface of the patella.

The instep is distinctly swollen and red, and it is tender just outside the outer malleolus. There is a little superficial redness also just above the outer malleolus.

After the shooting pains which he had at first on the outer side of the left foot, there was some numbness. It feels a little numb to-day.

This was undoubtedly a case of rheumatic neuritis. Had it not been for the presence of the subcutaneous nodules it would have been almost impossible to say that the condition was rheumatic, owing to the very indefinite nature of the joint symptoms. Their occurrence, however, shows somewhat conclusively that the neuritis was rheumatic in origin.

Case VIII.—*Subcutaneous fibroid nodules in a case of arthritis deformans.*

Mr. C., æt. —, was admitted to the Johns Hopkins Hospital on September 12, 1895, complaining of enlargement and deformity of the wrist, finger, knee and ankle joints, with pain in these situations.

A satisfactory history could not be obtained from the patient. There had been a history of gout in the family for several generations back.

The patient had his first attack of joint trouble 24 years ago. It commenced in the great toe joint.

The following note was dictated by Professor Osler:

Mucous membranes pale, face flushed, otherwise the patient looks well nourished.

The hands show very characteristic lesions of arthritis deformans.

Right hand: The right wrist is almost completely ankylosed; there is thickening about the bases of the metacarpal bones, and the knuckles are large. The interossei muscles are wasted. There is fair mobility of the metacarpal joints. The fingers have a strong ulnar deflection. There is ankylosis of the 1st and middle metacarpo-phalangeal joints, of the first interphalangeal joint of the index, middle and little fingers, and of the distal joint of the ring and little fingers. No Heberden's nodes.

The fingers are thin, and the skin a little rough and somewhat discolored over the joints. About the knuckles of the middle finger, chiefly on the extensor tendon as it passes over the joint, are 4 or 5 subcutaneous fibroid nodules. One flat yellowish-looking nodule exists on the extensor tendon passing over the knuckle of the ring finger. The extensor muscles of the forearm are a little atrophied.

Left hand: Ankylosis of the wrist much less marked, as also is the ulnar deflection. Ankylosis not so marked in the fingers. In the little finger Heberden's nodes are extremely well developed, and the joints are ankylosed. Nodes are well developed in the index finger. Flat subcutaneous nodules are present on the extensor tendon of the middle finger. Radial thickening on both sides.

The knees are very much enlarged, particularly the right, which is very much rounded; outlines of the patella are lost. Probably some exudation into the bursa. Patella not movable. Much less thickening about left knee; patella movable.

There is very slight flexion in the knees, much more in the left than right.

The ankle joints are uniformly enlarged; very slight mobility; obtuse thickness over the tarsus.

No tophi in the ears.

Heart.—Apex beat neither visible nor palpable. Loud, rough systolic murmur at the apex, transmitted towards the axilla. At the base there is a soft systolic, not loud or rough. Second sound audible and not accentuated.

Case IX.—*Chronic vegetative endocarditis with subcutaneous fibroid nodules.*

Dr. Osler has kindly given me the full notes of the following interesting case, which was seen in consultation with Dr. J. K. Mitchell, June 7, 1893. Only abstracts from the history will be given.

Martha S., aged 29, a native of Providence, R. I.

When 12 years of age patient had scarlet fever and rheumatism, evidently a severe attack, in which the doctors stated that her heart was affected. She gradually got better, but a year or two subsequently she had a second light attack.

About a year ago she began to have pains in the fingers, and some of the spots to be hereafter described appeared. Last summer she was at her home in Providence not at all well, having occasional attacks of pain in the feet and in the joints, with chilly feelings. About October she began to have more definite fever, preceded by marked chilly sensations, and she has been ill with occasional fever ever since, the temperature rising to 102° to 104°, sometimes with a definite chill. For the past month the temperature range has been from 97° to 104°. The joints, and particularly the ankles at times, have been red, swollen and painful.

To-day the only complaint she has is of pain in the right ankle, which is a little swollen, and just in front of the inner malleolus, reddened. There is no enlargement of the smaller joints.

The apex beat of the heart is forcible, outside the normal position. There is no thrill. On auscultation there is a loud systolic murmur, rough in quality, propagated beyond the axilla. The sounds at the aortic cartilage are clear, and the pulmonary second is very much accentuated.

There is no enlargement of the spleen or liver.

One of the most remarkable features about the case is the appearance of painful spots in and beneath the skin. These are apparently of three different characters: (a) reddened, elevated spots in various parts, resembling closely urticaria, and these appear and disappear. There were only two on the skin at the time of my visit; (b) local spots of soreness in the skin from two to three lines in diameter, not elevated, usually as Dr. J. K. Mitchell describes them, "pale pink, not elevated, not hard, exquisitely tender, and painful even without being touched"; (c) definite firm subcutaneous nodules which have appeared and disappeared, and which are very sensitive to pressure. At the time of examination one of these was present beneath the skin about the eighth rib on the right side. It had been one of a chain two inches long and winced on the slightest pressure.

The diagnosis was made of a chronic vegetative endocarditis with intermittent fever.

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CASES OF AMŒBIC DYSENTERY.

By CUNNINGHAM WILSON, M. D., *Birmingham, Alabama.*

The following cases of amœbic dysentery, occurring in my private practice, lack, in careful study, the hospital reports of such cases. Two of them, however (cases 2 and 3), are of more than usual interest on account of finding the amœbæ while examining the patients for other conditions. The first three cases falling into my hands at such short intervals of time led me to believe that this form of dysentery will be found to make up a large proportion of this disease in this climate. During 1894, however, only one case came to my notice, but in some suspicious cases I was unable to use the rectal tube to get the contents of the bowels.

The amœbæ did not differ in any way, as far as I was able to see, from descriptions given by Councilman and Lafleur and from those I saw from a patient in Dr. Osler's clinic at Johns Hopkins Hospital. There were no symptoms of abscess of the liver in any of the cases.

CASE 1. June 1, 1893. I saw for the first time B., white, male, aged forty-nine, married, of very large frame and

extremely emaciated. Has always lived in the South. About two years ago began to have frequent actions from bowels, consisting largely of mucus and blood. This condition has kept up with more or less severity since; at the time of my visit was having from one to twenty stools daily. Microscopic examination of a portion of the stool just passed showed numerous actively moving amœbæ. Frequent examinations of the discharges during the next three weeks always showed the amœbæ. At this time he left the city. His condition with rectal injections, milk diet and other remedies improved very little.

Case 2. S., white, male, aged 30; locomotive engineer. In 1890 had an attack of dysentery which lasted him two weeks. Since then has had several similar attacks of less severity. August 15, 1893, came to me complaining of internal hemorrhoids, otherwise feeling well. Examination of rectum with speculum revealed two or three small hemorrhoids and higher up two superficial ulcers. Removing the speculum, a quantity of bloody mucus adhered to it. Placing a small portion of this under the microscope, active amœbæ were found. On more careful inquiry it was found that he had been having frequent, small and painless bloody discharges from the bowels which he had taken as symptoms of hemorrhoids. He was advised to use rectal injections of quinine solution. A few days later he was attacked with a violent dysentery which confined him to his bed for three weeks. The amœbæ were abundant in the dysenteric discharges. Ice-water injections with suppositories of iodoform and opium seemed to give him most relief. During the following winter he had another attack, but has remained well since.

Case 3. W., white, aged twenty-eight, single; telegraph operator. Was born in Ohio; has lived in Alabama three years. His first sickness was a rectal abscess two years ago, which resulted in an anal fistula. During the past year has had several attacks of diarrhœa with considerable cramping in lower bowels. September 3, 1893, came to me to have an operation for cure of fistula. Examination showed a superficial fistula. On removing the speculum there was adhering to it a quantity of blood and mucus similar to what I had seen in Case 2. Microscopic examination showed numerous active amœbæ. Three days later he was attacked with a moderately severe dysentery which kept up for a week. The amœbæ were constantly found during the attack. His strength was considerably reduced and he remained in poor health until October 1, when he took a vacation East and soon regained his health, which has remained good since. Treatment during attack was cold water injections with iodoform and opium suppositories.

Case 4. F., white, male, Russian. Was seen a few hours before death, September 15, 1894. No history could be obtained. He was having frequent involuntary actions of mucus and blood from bowels. An autopsy was held four hours after death. Nothing of consequence was found in thorax except sclerotic changes in blood-vessels. In the abdomen the entire big gut was prominent, very much thickened and adherent to neighboring structures. The omentum had engrafted itself to the transverse and descending colon, at many points, preventing perforations. The gut was easily torn, tearing by its own weight when lifted. The mucous surface was an area of necrosis, indented with deep ragged ulcers, many of them just ready to break through. Examination of contents of the ulcers showed numerous active amœbæ. Sections of the intestinal wall showed, in a marked degree, the hyaline degeneration described by Councilman and Lafleur (Johns Hopkins Hospital Reports, Vol. II), of muscular fibre as well as of the plastic material thrown around the intestine. Sections of the liver showed advanced cirrhosis. Chronic interstitial changes had taken place in the kidneys.

PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS HOSPITAL MEDICAL SOCIETY.

Meeting of October 7, 1895.

Dr. Simon Flexner was elected President and Dr. J. G. Clark Secretary for the coming year.

Hyperpyrexia in Typhoid Fever.—Dr. Osler.

Among the 389 cases of typhoid fever under treatment in the Hospital during the first six years of its work, there was only one case (fatal) with a temperature of 107°. I do not remember the details of it just now. Within the past few weeks we have had two cases in which the temperature registered 107° and over.

The first case is of some interest in other respects. The man was admitted on September 14th. He had been ill for about two weeks. When admitted he was in a very excited condition, fearful and apprehensive, and exceedingly alarmed about having so protracted a fever. He had characteristic rose spots and slight enlargement of the spleen. The temperature was not high and he had no diarrhœa. For a few days he seemed to be doing very well. The most unpleasant feature of this case was the constant mental apprehension. On the fourth day after admission the temperature reached 104°, and then ranged between 103° and 104° till the seventh day. The sponges reduced his temperature fairly well. I saw him at half-past eleven on the seventh day, and he then seemed to be somewhat better than he had been for a few days. He had been delirious through the night and tried to get out of bed. The abdomen was slightly distended. There was no pain in the right iliac fossa. At half-past eleven the temperature was 104°. At 1 p. m. he had a severe shaking chill. The respirations were hurried; there were loud expiratory groans; the expression was that of fright, and the patient cried out that seemed as if someone to kill him. The pulse was much dilated, but soon; the ... and a little semiconscious; sweated profusely. The temperature at noon was 104.2°; at 1.15 was ...... About 4 in the afternoon ..... patient all this ..... face dusky. At 1.45 the pulse could hardly be felt. At this ....

but no actual convulsion. The cyanosis became more marked, the patient became weaker, the temperature rose at 2 o'clock to 107.5°—the highest recorded temperature we have had in typhoid fever—and he died at 2.45.

The second case, a colored girl, at present in the Hospital, was admitted about the third week of the fever. She looked very ill, and the nervous symptoms were pronounced. She had excessive jactitation, tremor and delirium. The temperature was 103°, and rose to 104° at 8 p. m. At 2 a. m. it was 102°, and then rose gradually till at 8 a. m. it registered 107.2°. With ice-sponging her temperature was reduced very promptly. She was sponged at eight, ten, twelve and two, and by 2 p. m. her temperature was reduced to 102°, and by 8 p. m to 100°. From that time she did remarkably well.

Abscess of the Liver, perforating the Lung.—Dr. Osler.

Of the eighteen or twenty cases of abscess of the liver which have been in the wards, six (including the present) have discharged through the lung. This patient, aged 40, a resident of Birmingham, Ala., was well and strong until June 10th of the present year, when he had an attack of diarrhœa which lasted three weeks. The movements were frequent—four a day; soft, not watery; contained no blood (of this he is sure), and were not accompanied with much pain. There was no swelling of the abdomen. Early in July he became jaundiced and had pain in the right shoulder, and about July 15th pain in the lower ribs. He lost rapidly in weight. About July 20th he began to expectorate large quantities of pus—about a quart in the first two days. A week later the pus began to contain blood. The expectoration of blood and pus has continued to the present time. We saw him on September 12th for the first time; this was nearly two months after the first discharge of pus. When admitted September 12th he had a moderate fever, was pale and sallow-looking, and in a wretched, feeble condition. Now, as you can see, he has improved very greatly. The color is very good, and he has lost entirely the anæmic look which he had upon admission. The physical signs were very indefinite. There was defective expansion over the lower lateral region of the chest. The intercostal spaces were visible, but not quite so grooved as on the other side. There was flatness from about the fourth rib and defective breath sounds. There was no sign of a cavity; no large gurgling râles. His expectoration was very interesting and peculiar. It was of the anchovy-sauce-like character which was referred to by Budd as almost characteristic of the material coming from the liver. On the first day of his admission we found the amœbæ coli. They were never found in large numbers, but they were perfectly distinct and their movements were well marked. They have been present at intervals ever since. The patient has gained about seventeen pounds in weight, the temperature is normal, and he will in all probability get perfectly well.

Discharge of the abscess through the lung is perhaps the most favorable method of spontaneous rupture of liver abscess. Of the six cases in which perforation took place through the lung, three got well. One patient, William Webster, who was shown at this Society meeting on several occasions, was in the house on four or five successive occasions during a period of three years and finally, I believe, has recovered.

Pyarthrosis.—Dr. Finney.

We happen to have in the Hospital just now three cases illustrating a subject which is creating considerable discussion at present in the surgical world—that is, the treatment of pus-joints.

The first case is that of a lad, seventeen years of age, admitted to the Hospital, August 8th, under Dr. Bloodgood's care. Early in June he had a pain in his left knee, which was followed by some swelling and tenderness and slight pain on motion. He was unable to walk with comfort for about a week; after that it gave no further trouble. This was clearly a case of synovitis. Two days before admission to the Hospital, while playing base-ball, he fell and injured the same knee. This was followed by rapid swelling, great pain and tenderness. On admission his temperature was 104°; pulse, 120; face flushed. The left knee was contracted almost to a right angle; it was most comfortable in this position, resting on the outer side. The joint was much swollen, with the patella floating. There was considerable fixation, due to muscular spasm. Some redness about the joint, and it was extremely tender. The joint was first aspirated and a cloudy fluid withdrawn. Later it was incised in the manner about to be described.

This method is the point of especial interest to us. It was suggested by Dr. Halsted because of the uniformly unsatisfactory results of the old method, which was by aspiration, or incision, followed always by the insertion of drainage tubes. The final result of that operation was, in the most favorable cases, a stiff knee. In many there was a resection of the joint later, and in a large proportion of cases an amputation of the leg. The operation done in this case was, after applying a tourniquet to the thigh, to make a long incision into the joint on either side of the patella, through which the joint was irrigated with several gallons of $\frac{1}{1000}$ bichloride solution. Then the tourniquet was removed, the wounds covered with protective and treated in the ordinary way. There is little to be seen now except two parallel granulating wounds. He has been recently anæsthetized and the fibrous adhesions which had formed broken up.

The second case has a very similar history to the first one. He was playing a game of base-ball and was struck by a pitched ball just above and to the outer side of the popliteal space. He did not stop his playing and noticed nothing the matter with the joint until the next morning, when he was waked up by an intense pain in the joint, which was red and swollen. Two days afterward he came into the Hospital with a temperature of 103.5°, rapid pulse; joint very much inflamed and swollen. We aspirated and found a pure culture of streptococcus. The next day we opened the joint in the manner already described, and with one long irrigation the temperature dropped at once, his pain disappeared and has never returned. He has now a granulating wound, as in the other case. He has some motion.

Aspiration in the first case showed that the fluid was full of staphylococci. There was a very marked granular, velvety condition of the synovial membrane. He was irrigated each day for perhaps two weeks before his temperature came down. Then the irrigation was stopped and the wound treated in the ordinary way.

The third case is a still more interesting one. I do not bring him before you because the operation has been done very recently and the patient is a small boy and has been quite sick, so I did not care to disturb him. He was admitted to the ward on Friday, September 25th. On September 20th the patient had some pain in the left knee on walking. There is no history of traumatism of any kind. On the following day the knee was somewhat swollen and the pain more marked. On September 23d the joint was more painful, but the patient was able to be up. On the 24th the patient was unable to walk; knee swollen and painful on the least movement; comfortable while lying still. Fever noticed first at this time. No chills; no sweats. Examination on entrance resulted as follows: Face flushed; anxious countenance; tongue red and dry. No abrasion on any part of body except a small abscess on right hand which he had opened several days before with a needle. Skin over the knee hot and somewhat reddened. Evidence of considerable effusion in the joint. Motion limited and causes pain. Examination of other organs of the body negative. He was aspirated by Dr. Bloodgood. Examination of fluid removed at first, negative. His temperature and pulse still continued high, and on the next morning the joint was opened through a small incision, irrigated thoroughly and then closed. That night his temperature dropped to 101°, but went up the next day. In the meantime, cultures which had been taken developed a mixed infection of staphylococci and streptococci. The next day, his temperature and pulse keeping up, I operated on him in the same way as on the other two. The condition of the synovial membrane was different from that in either of the others; it was covered with a fibrinous exudate, and was pale and smooth, not granular. Two days afterward he began to complain of pain in his elbow and shoulder. These began to swell and fluctuation was observed. Dr. Bloodgood aspirated, but nothing was found. Then cultures were taken from his blood, and of several cultures, staphylococci developed in two. The other tubes were negative, so it is possible that these two may have been contaminated; and it is a question, although they were taken with the greatest care, therefore, whether or not bacteria were present in the blood. We have not opened the other joints, but are simply irrigating the knee. The pain in these joints is diminishing, and to-day for the first time his temperature is normal.

We have had four other cases that I can recall treated in this manner. Of these four, one has had a perfect result. It was a punctured wound of the joint, which was opened and treated in this way. Two cases--one infected with streptococci, the other with staphylococci—healed with limited motion. One case did not return for passive motion, and he is probably responsible for a more or less stiff joint. The fourth was a case of gunshot wound of the joint in which both staphylococci and streptococci were found, and also the gas bacillus. After irrigation this joint was closed. It later came to amputation, because of an extensive invasion of the soft parts of the leg and thigh by the gas bacillus.

DR. WELCH.—Is the joint closed after the irrigation with bichloride?

DR. FINNEY.—It is left open.

DR. WELCH.—This procedure of opening and irrigating pus joints is interesting in reference to the question of disinfecting surfaces of the body. There has been a good deal of experimental work done by Schimmelbusch and others, with the object of ascertaining whether it is possible to disinfect an infected surface or to prevent infection. Doctor Williams has made some observations here with reference to that point in cases of streptococcus infection of the endometrium. He has shown that the micro-organisms are so deep that one cannot possibly think of the disinfectant reaching them. While there appears to be no doubt of the superior efficacy of irrigation with disinfectant solutions, as opposed to simple salt solutions, the grounds for this are not altogether apparent, as experiments show that these disinfectants do not actually kill all of the organisms even on exposed surfaces, and, of course, do not reach those in the depth of the tissues. Of course these remarks relate only to the possible theories or explanations of the process of cure and are not a criticism of the efficacy of the procedure, which is determined only by experience.

I remember the gas bacillus case very well. It interested us extremely because the operation was done within twenty-hours of the injury. The bacillus must have been introduced into the joint by a bullet, and this gives conclusive evidence that this organism is really in the outer world. We have now evidence that it is a widely distributed organism. This is the first conclusive observation, however, of its existence outside of the body.

Specimen of Stomach Removed after Francke's Operation for Gastrostomy. DR. FINNEY.

I bring this specimen here simply to complete the history of a patient whom I showed to the Society last December. The patient died six and one-half months after the operation, apparently from inanition. While in the Hospital he gained weight and strength. He was fed through the fistula which we made, and at no time was there any leakage through the fistula, which is the test of the operation. The cause of his death was not apparent except that he was very much emaciated. There was little or nothing found in his intestinal canal. It is possible that he was not fed sufficiently. His trouble was a carcinoma of the œsophagus, which was about on a level with the cricoid cartilage. It was a very favorable case because there was no involvement of the glands, except one gland just beside the cancer. It would have been a very favorable case for extirpation.

The specimen is here for your inspection. It shows how the fistula was formed, and seems like a very satisfactory one.

DR. WELCH.—In the case of death from œsophagus, it does not seem necessary. In cases it was because the patient was insufficiently fed. Persons die with cancer, particularly of the part of the tract, without extensive metastases, in rather inexplicable ways. The cases sometimes develop a profound anemia that they can be mistaken for pernicious anemia. These observations show that in cases of cancer of the œsophagus and stomach there are often very slight changes in the gastric

glands which interfere with digestive functions. There are other possibilities without assuming that the patient was insufficiently fed.

Schede's Operation for Varicose Veins of the Leg.—Dr. Finney.

Many operations, palliative and radical, have been suggested from time to time for the relief of varicose veins. Palliative measures are good in the less severe cases, but in the more severe cases they are of little service. Of the radical operations, that of Trendelenberg—the ligation of the large saphenous vein below the saphenous opening—is perhaps the best. Extirpation of the veins, after Madelung, and multiple ligation, after Phelps, have been followed by good results. This operation of Schede has the same idea in view—cutting off the column of blood from above—but does it more effectually than any of the other methods. It is simply a circumcision of the entire leg at about the junction of the upper and middle thirds, dividing the skin and subcutaneous tissues down to the deep fascia, tying the bleeding points, and then sewing up the incision. I saw many cases thus treated in Schede's clinic, and was told that excellent results followed, not only the rapid healing of ulcers, but permanent relief from the dilated veins. We have performed the operation in four cases lately. They have all left the Hospital well. I had hoped to have one of them present to-night, but he found it impossible to get here. That case was especially interesting because he had a large ulcer which healed very rapidly after the operation, but which he writes has begun to break down again and cause him trouble since his return to work. Perhaps the operation does not give much more permanent results than the others.

NOTES ON NEW BOOKS.

Helps in Sickness and to Health ; When to go and what to do, etc. By Henry C. Burdett. With nineteen illustrations. (*London: The Scientific Press, Limited*, 1894.)

This little book, which is a second edition of two smaller manuals entitled "Helps in Sickness" and "Helps to Health," published some time since by Mr. Burdett, is divided into three parts, the first being Helps to Health ; the second, Treatment and Nursing of Emergencies and Simple Ailments, and the third, the list of public institutions and hospitals in England and Wales, being of local rather than general interest. The directions in the first and second parts are in familiar language and are clear and sensible. They cover a wide range of subjects and the suggestions are timely and judicious. The book ought to be in the hands of every family and nurse. Although a portion of the work is intended for England, the book as a whole will be useful throughout the world.

Twenty-fifth Annual Report of the State Board of Health of Massachusetts. (*Boston: Wright & Potter Printing Co., State Printers*, 1894.)

We have had occasion in former years to commend the thoroughness of the annual reports of the Board of Health of Massachusetts. The report under consideration is probably the most valuable of any which has been published, and the methods of work detailed might safely be imitated by the Boards of Health of other States. The excellent work which has been done in supervising the water-supplies of the whole State, and n giving advice as to what ought to be done to improve the quality of the water furnished by the different municipalities, is worth infinitely more to each municipality than the cost of maintaining this Board. If State Boards of Health would do work of this character we should hear fewer complaints of the indifference of taxpayers to sanitation. The examination of water-supplies, which was begun in 1887, has been continued until the present time, and has practically given the Board of Health full knowledge of the potability of all the waters of Massachusetts. In what other State of the Union can this knowledge be said to exist ?

No less valuable have been the data collected respecting the filtration of sewage and the continuous efficiency of filters. The conclusions given upon this subject, and upon the filtration of water, should be carefully considered by all who are responsible for the health of cities, both in the matter of water supply and the removal of sewage. The deductions, as to the cremation of sewage, derived from the experiments at the Chicago Exposition, are not as conclusive as one could desire, because of the imperfection of the apparatus employed and the necessarily tentative character of the methods used. A perusal of this report leads one to the irresistible conclusion that the day is not far distant when the water supply of every city must be filtered before it is used, and the sewage of every city must be rendered harmless by cremation or filtration.

The Care of the Baby : A Manual for Mothers and Nurses containing Practical Directions for the Management of Infancy and Childhood in Health and Disease. By J. P. Crozer Griffith, M. D. (*Philadelphia : W. B. Saunders*, 1895.)

This is a capital little book, judiciously planned and clearly written. It gives such details as the mother and nurse should know in simple language. There are explicit directions for dressing, feeding and taking care of the baby ; also a chapter on the sick baby, which if carefully read will do much to render the mother watchful, and help her to know when the doctor should be summoned. The book can be safely commended for the use of those for whom it is stated to have been written.

BOOKS RECEIVED.

Transactions of the Medical Society of the State of Pennsylvania at its Forty-fifth Annual Session, held at Chambersburg, 1895. Vol. XXVI. 8vo. 504 pages. 1895. Published by the Society, Philadelphia.

Index Catalogue of the Library of the Surgeon-General's Office, United States Army. Authors and Subjects. Vol. XVI. W–Zythus. 4to. 1895. 822 pages. Government Printing Office, Washington.

Alphabetical List of Abbreviations of Titles of Medical Periodicals employed in the Index-Catalogue of the Library of the Surgeon-General's Office, United States Army, from Volume I to Volume XVI, inclusive. 4to. 1895. 282 pages. Government Printing Office, Washington.

System of Surgery. Edited by Frederic S. Dennis, M. D., assisted by John S. Billings, M. D. Vol. II. Profusely illustrated. 1895. 8vo. 926 pages. Lea Bros. & Co., Phila.

Transactions of the Association of American Physicians. Tenth session, held at Washington, D. C., May 30 and 31, 1895. Vol. X. 8vo. 1895. 406 pages. Printed for the Association, Philadelphia.

CONTENTS.

BACILLUS PYOGENES FILIFORMIS (NOV. SPEC.).[*]

By Simon Flexner, M. D., *Resident Pathologist, The Johns Hopkins Hospital ; Associate Professor of Pathology, Johns Hopkins University.*

[*From the Pathological Laboratory of the Johns Hopkins University and Hospital*.]

(Preliminary Communication.)

During the past winter a large healthy female rabbit of the stock of the laboratory gave birth to a litter of young, and about the fifth day following parturition, although it had not appeared ill, was found dead in its cage. Following the rule of the laboratory, which is to make autopsies upon all animals which die, this one was examined in the usual way. It is necessary to state that the young of this animal were found dead before the death of the mother occurred.

The animal bore its litter on March 13th or 14th, and was found dead on the morning of the 18th. The autopsy was performed in the afternoon of the 18th.

The body was well nourished ; there was no evidence of death from violence, the mammary glands were still large, and upon section a lactiferous fluid escaped from their cut surfaces. There was no excess of fluid in the peritoneal cavity, the layers of the serosa appearing normal except as is about to be mentioned.

The condition of the uterus especially arrested attention upon the examination of the abdominal viscera. It was several times larger than the normal, although much smaller than the uterus of the rabbit at term, and presented a series of dilatations and contractions which, except for their irregular distribution, might have been mistaken for a pregnancy. This condition was, however, hardly to be considered under the circumstances, and indeed upon inspection the dilated pouches appeared thin and semi-translucent, and gave the impression of being quite empty. The serosa over the dilatations was injected ; the vessels of larger size being very prominent and turgidly filled with blood, the intervening tissue presenting a rosy hue. Both cornua of the uterus were similarly affected. Nothing abnormal was observed in connection with the ovaries. On opening the uterus after its removal with the vagina attached, the pallor of the mucous membrane contrasted with the injection of the serous coat. This pallor of the mucosa was of a peculiar opaque quality and unlike the appearance of the velvety membrane itself. On gently stroking the mucosa with a knife a thick, opaque material could be removed, which appeared to be only lightly adherent to the surface of the membrane. It was to the pres-

[*] Read before the Johns Hopkins Hospital Medical Society, November 4, 1895.

ence of this material that the peculiar opacity was due, and the exudate extended from the vagina throughout the entire extent of the uterus. In the dilatations before mentioned the mucous membrane was of extreme tenuity, and here, as might have been expected, the layer of opaque exudate was thinner than elsewhere. The impression was given that the dilatations were brought about by accumulations of a gas. After the removal of the exudate the underlying mucosa was found to be congested. The other organs of the peritoneal cavity apparently were normal.

The pleural cavities contained fluid which was not in large amount and of a transparent hæmoglobin-red color. The serosa itself was covered with a thick shaggy layer of a fibrin-like material. Both the parietal and visceral layers were covered with this material, which was very thick over the region of the diaphragm. The lungs were in part voluminous, in part collapsed, the expanded portions being of a firm consistence and apparently consolidated. The bronchi contained fibrinous plugs.

The pericardial sac contained a small amount of fluid between layers of a shaggy appearance, due to the presence of a fibrinous-looking exudate similar to that found covering the pleuræ. It was, however, thinner here than there.

The lymph glands of the body showed no especial enlargement and the other viscera no gross pathological changes.

Bacteriological Examination. Cover-slips made from the exudate in the vagina and uterus showed a surprisingly large number of organisms which were strikingly pleomorphic. These organisms form for the most part thread-like structures; not a few, however, are much smaller. They vary from bits only a little larger than cocci to thread-like forms as long as the longest anthrax chains. At first sight there would appear to be several kinds of bacilli present; but the appearance, in both large and small forms, of a striking irregularity of staining makes this improbable. Very few of the bacilli stain regularly, for the most part brightly staining spots appearing between unstained areas. An outer membrane always stains, enclosing the stained dots in a colorless ground. A closer study reveals the stained particles to occur with much regularity, that is, they are about equidistant in the longer forms, where they are best studied, and in general they are of the same size. The threads are not as a rule straight, but present delicate sinuous and wavy outlines. The short forms are straight with rounded ends. Among these organisms a large number of pus cells and a few larger cells with single vesicular nuclei were scattered. Although many pus cells were present in the exudate, yet from the appearance of the cover-slips no inconsiderable portion of it must have been furnished by the bacilli.

Cover-slips made from the pericardial and pleural exudates, as well as from the consolidated portions of the lungs, showed the same organisms. While they were very numerous in the cover-slips from these situations, they were not as abundant as in the uterus.

Aerobic cultures were made upon various media, Loeffler's blood serum, sugar-agar, sugar-bouillon, plain agar and bouillon, the agar, urine and serum mixture; anaerobic cultures were made in plain and sugar-agar and bouillon as well as upon blood serum in Buchner's jars and an atmosphere of hydrogen. All these kept in the thermostat for several days at 37° C. showed no growth whatever.

Fearing that it would not be possible to cultivate the organism upon the usual media, the pleural cavity of a second rabbit was inoculated by breaking up a speck of the pleural exudate from the first one in bouillon and injecting the suspension with a sterilized syringe, after making a small skin incision, into this cavity. This inoculation was positive in its results.

Subsequent experiments were conducted as in the previous one by transplanting small bits of the fibrinous material from the inflamed parts of previous animals, or of the fluid which was also present in the pleural cavities in the other animals. In this way the series was kept continuous and the bacilli alive.

Considerable variations were observed according as the inoculations were made into the pleural cavity, the peritoneal cavity, the subcutaneous tissues, beneath the dura mater, or directly into the circulation.

The inoculations were positive in all cases except a few in which they were made subcutaneously. The death of the animal occurred soonest when inoculation was made beneath the dura mater. A small portion of the skull was trephined, under the usual antiseptic precautions, and a drop of the pleural fluid or a speck of the fibrinous exudate was introduced beneath this membrane, care being taken not to injure the brain. These animals, which quickly recovered from the effects of the operation, died on an average about twelve hours after the inoculation. The usual appearances were as follows: The external layer of the dura, excepting at the point of puncture, appeared quite normal; the internal layer was injected. Corresponding with the point of puncture, but smaller, a grayish-white area was visible, this being most marked in the case of the introduction of a bit of the fibrin, and doubtless consisted in part of the introduced exudate. The pia was distinctly reddened, the vessels being more prominent than normal, and the meshes of the pia contained a thin but otherwise distinctly turbid fluid. There were no pathological changes to be observed in the cortex of the brain, nor were any found in the ventricles.

Cover-slip preparations made from the point of inoculation showed, besides pus cells, a very large number of the typical bacilli. Similar preparations from the meninges at a distance from the point of inoculation also showed bacilli, but they were fewer in number, and among them more or less leucocytes with amphophilic granulations and polymorphous nuclei were scattered.

The pleural inoculations were followed by death, as before stated, in every instance, the death of the animal occurring upon the third or fourth day. The appearances presented at autopsy were for the most part an exact reproduction of those observed in the animal which had succumbed to the natural disease. Upon the side of inoculation a thick grayish-yellow shaggy membrane covered the pleural surfaces, being at times four or five millimeters in thickness. The pleural cavity contained several cubic centimeters of a clear hæmoglobin-colored fluid besides, the lung for the most part being compressed. At times smaller or larger areas of lobular pneu-

monia would be present; and as a rule the inflammation was not limited to the serous membrane of the side of inoculation, but extended into the opposite pleural cavity and into the pericardial sac. However, in these situations the process was as a rule less intense, the solid exudate being less considerable, and in the case of the opposite pleural cavity sometimes entirely wanting. The superficial vessels, however, were injected and the serous surfaces of the affected membrane covered with a slimy material. In addition to this, the opposite pleural cavity always contained a pink serum similar to that described upon the side of inoculation.

The study of the exudate upon the side of inoculation, as well as the fluid contained in the opposite pleural cavity and in the pericardium, showed the same organisms as had been introduced. They were most numerous upon the side of inoculation and in the solid portion of the exudate. So far as could be determined by the use of cover-slip preparations, they were absent from the blood and distant viscera.

The inoculation of the fluid from one of these pleural cavities into the peritoneum did not always succeed in causing the death of the animal. The periods of incubation in these cases, even when the inoculations were successful, were longer than in the previous ones, the animals affected often not dying in less than a week. The results of the peritoneal inoculations were to produce either a general sero-fibrinous peritonitis or a circumscribed fibrinous peritonitis. In several instances where the inoculations were made into the pleural cavity, an extension through the diaphragm with the productions of a localized pseudo-membranous inflammation over the liver was observed. The exudate in all these cases showed large numbers of typical bacilli upon microscopical examination.

In several instances the subcutaneous inoculation of the pleural fluid was successful. Larger and smaller areas of tissue were converted into a rigid fibrinous material in which bacilli were found in large numbers.

Perhaps the most interesting, certainly the most widespread, effects were obtained by the intravenous inoculation of the pleural fluid. The results were uniformly fatal, the animals all succumbing in from two to four days after inoculation. At autopsy abscesses were present in the viscera. These were generally miliary in size, although at times they were larger and spreading. Preferences were exhibited in reference to their localization, certain organs being entirely spared. The abscesses were never absent from the brain and heart muscle. They appeared occasionally in the liver, more rarely still in the voluntary muscles, never in the kidneys or the lungs.

The effects of the intravenous inoculations with respect to the points of localization of the bacilli were in part determined by the local conditions; for example, the inoculation into non-pregnant female animals was not followed by the reappearance of the micro-organisms in any of the structures of the genital tract, whereas in the case of pregnant animals the inoculations were followed by the re-localization of the organisms and the inflammatory process in the pregnant uterus.

The appearances first described in the uterus of the animal dead of the natural disease indicated that an accumulation of gas had occurred in this structure. This appearance was again observed in the experimental disease in this situation, and also in several instances in which the inoculations were made into the subcutaneous tissue and in the pleural cavity, in the last instance the gas bubbles appearing in the inflamed mediastinal tissues.

Cultivation Experiments. From time to time in the course of the transference of this organism from animal to animal, attempts were made to cultivate it. The repeated use of ordinary media in aerobic and anaerobic cultures failed as in the first instance. The use of more concentrated media, as for example five per cent. peptone in solid and fluid forms, also was without success. An attempt was now made to cultivate the organism upon the organs of a healthy rabbit, which were removed with all precautions and transferred to sterile test tubes. Only occasionally did one of these tubes show contamination. Those which were uncontaminated and had shown no growth for several days were inoculated with material from the experimental animals. For the first time a growth was obtained, not, however, upon all the organs. The growth was fairly vigorous upon the lungs, the heart and the uterus, and perhaps upon the kidney; no growth occurred either upon the spleen or liver. Transplantations from these growths were successful only to the extent of one or two subsequent generations. The best results were obtained by cultivating the organisms upon several one-third to one-half grown fœtuses obtained from the rabbit, upon which medium transplantations were successful through a series of six of these objects. The inoculations of animals from the sixth generation of the bacilli obtained in this way, either into the pleural cavity or into the circulation, were followed by positive results indistinguishable from those obtained by the use of the pleural fluid before mentioned.

Further facts concerning the morphology and biology of this organism, such as the question of spore formation, thermal death point, the effect of drying, the length of vitality outside the body, as well as the pathological histology of the lesions caused by it, will be given when the full details of this study are published.

A CLINICAL AND EXPERIMENTAL STUDY OF THE SO-CALLED OYSTER SHUCKER'S KERATITIS.*

By ROBERT L. RANDOLPH, M. D.

The extent of the injury inducing the so-called oyster shucker's keratitis does not explain the violent reaction that follows. This fact seems to have impressed every ophthalmologist who has been brought into frequent contact with the disease. Cinders and small particles of steel or sand, when they lodge on the cornea, often remain in situation for several days without causing apparent infiltration of the surrounding tissue, and not infrequently does one meet with a case where a cinder has been imbedded in the cornea a considerable length of time without giving rise to anything but unpleasant subjective symptoms. The most common foreign bodies removed from the cornea are the filings or chippings of iron or copper, or particles of emery, sand and cinders. It is rare that we see an area of infiltration about the foreign body, and when this latter condition exists it usually means that the foreign substance was infected with pathogenic bacteria, or by its continued presence and consequent irritation has brought about conditions favoring the invasion and growth of micro-organisms. When we consider the remarkable resources of the eye for nullifying the effects of pathogenic bacteria we may safely say that a foreign body of the nature just mentioned, when it lodges in the cornea, will as a general rule give rise to an appreciable keratitis only after it has remained in situation for a number of days.

What is known as oyster shucker's keratitis is distinctly a traumatic affection, due to an injury from a particle of the oyster shell. The disease is chiefly remarkable for the rapidity with which an area of infiltration appears at the site of the wound, in marked contrast to the history of wounds by other kinds of foreign bodies of the same size and in the same location.

The existing evidence indicates that oyster shucker's keratitis is found more frequently in Maryland than in any other part of this country. Dr. Jas. A. Spalding, of Portland, Me., writes me that the affection is practically unknown in that part of the United States, and the same can be said of the disease in Charleston, S. C., from information kindly furnished me by Dr. Kollock of that city. The reports of the New York and Philadelphia eye hospitals contain now and then a few cases, but Baltimore seems to carry off the palm. In New Orleans the disease as such appears to be unknown. The reports of the eye hospitals in Baltimore contain the records of several hundred cases during the past few years.† The frequency of the disease in Maryland may be explained by the fact that the oyster industry is a more extensive one in that state than it is anywhere else in the world. Cases of the disease do occur no doubt in New Orleans and Portland, Me., so that probably latitude has nothing to do with determining

its existence, nor is there any reason for supposing that the keratitis is to be traced to some organic or inorganic property peculiar to the oyster shell of the Chesapeake Bay.

Baltimore is the greatest oyster market in this country, and, according to Ingersoll ("The Oyster Industry," by Ernest Ingersoll, Tenth Census of the United States, Washington, 1881), there are at least six thousand shuckers in Maryland, and most of these are found in the shucking houses of Baltimore. In many of the northern cities, as for instance in Portland, Boston and New York, oysters are received in great quantities that have been shucked in Baltimore, so that oyster shucking in those cities evidently does not exist as a trade to the extent that it does in Baltimore. The magnitude, then, of the oyster industry in this city may be said to account for the frequency of oyster shucker's keratitis.

In a large number of the cases reported here the oyster shuckers had been plying their trade for many years and had been struck for the first time. In two cases the men had shucked for eighteen years without being struck, and it is surprising to note the fact that in none of the sixty-five cases reported were there any novices (new hands). It will be seen then that it is possible to shuck oysters for many years and still to escape injury from a particle of shell, and that the great majority of oyster shuckers escape altogether. Hence we cannot regard the disease as a very common one. It is more than probable that long familiarity with the work breeds contempt of its dangers, and this may explain why in nearly all cases it is the veteran who is wounded and not the recruit. It is very much the same kind of danger that surrounds the mechanic at the emery-wheel. Possibly the danger is a little greater in the case of the oyster shucker. Considering then the number of oyster shuckers in Maryland and the quantity of work done, it may be said that the disease is of exceptional occurrence.

Causes: As I have said, the disease is distinctly of traumatic origin; that is, a minute particle of the oyster shell is violently chipped off by the hammer* that is used in the shucking process, and it flies into the eye. The particle is generally too small and too light to penetrate to any distance into the cornea. Large pieces, however, are sometimes detached and are driven through the entire thickness of the cornea, and when such a thing happens loss of the eye usually results. This occurrence is happily rare. Unlike other foreign bodies that lodge in the cornea, the particle of shell can seldom be detected. This I think is due to the fact that in the rapid infiltration that takes place the particle of shell is thrown off. It is no

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* The use of the hammer to break off the edge of the shell before introducing the knife-blade constitutes the chief element of danger in oyster shucking as practiced here in Maryland. In other sections, as for instance in the far South and down East, the shucker dispenses with the hammer and sticks in the point of the knife at once in order to pry open the shell. This no doubt explains why the disease is seldom seen in the portions of the country just mentioned.

uncommon thing to see a particle of steel that is surrounded by a necrotic area drop out at the slightest touch, and sometimes we meet with these small points of infiltration where no foreign body can be detected, it evidently having been dislodged or thrown off in the suppurative process. In two or three instances I have succeeded in removing from the centre of one of these areas of infiltration a small particle of what was undoubtedly a piece of shell. My friend, Dr. B. W. Goldsborough, who lives in Cambridge, Md., one of the smaller oyster shucking centres, tells me that he has more than once removed small particles of shell from these infiltrated areas. No doubt in many cases the piece of shell simply strikes and wounds the cornea without lodging in it. The superficial nature of the injury readily explains why the particle of shell would be apt to drop out as soon as infiltration began.

Symptoms : The photophobia in oyster shucker's keratitis is marked. The patient tells us that he has a defined sensation of having been struck in the eye. This sensation is not usually followed by pain until some hours later. Frequently the exposure to artificial light, as for instance the lighting of the gas or lamp the evening of the same day, will mark the time when the unpleasant symptoms begin. From now on the pain is usually intense, and the clinical symptoms resemble those of phlyctenular keratitis somewhat intensified.

In an article which appeared in the *Virginia Medical Monthly* about fifteen years ago*—which article, by the way, is the only publication known to me on this subject — the writer states that the position of the ulcer is a constant one, that it is always found in one place, and this is the centre of the cornea. The most exposed part of the cornea is the point that is usually struck, and as this part represents an area through which the visual line is passing at the time, and as the visual line always passes through the cornea somewhere near the centre, the location of the wound will be here, and for no other reason, though this explanation does not seem to have occurred to the writer of the article referred to, other reasons being given by that writer for the location of the keratitis. It may be added that this location of the ulcer is not an invariable one, for I have frequently noticed a peripheral situation.

There is usually more or less circumcorneal hyperæmia. The ulcer is very white, whiter than other corneal ulcers. I have never seen such an ulcer with blood-vessels running to it, and its size no doubt is dependent more or less upon the size of the particle of shell. The ulcer is sharply circumscribed as to its borders, which, instead of fading off gradually into the adjacent tissue, will be seen to lie adjacent to perfectly transparent cornea. Such an ulcer suggests more strongly a chemical than a parasitic origin. The ulcer does not show the same tendency to spread as do other corneal ulcers, and when the keratitis assumes a diffuse character it is probably an evidence that bacteria have invaded the tissue at this point. Such complications do occur. I have seen such an ulcer remain absolutely localized for two or three weeks without any apparent departure from its original borders. On

*Oyster Shucker's Corneitis, by W. J. McDowell, M. D., Va. Med. Month., Vol. V, page 883.

this account the prognosis is favorable, though this is largely governed by the size and depth of the wound. A perforating wound of the cornea or a wound involving a large area is usually followed by loss of the eye, and this is especially true when the former condition is present.

Treatment : The yellow salve has proved useless in our hands. The galvano-cautery was used in a certain number of cases, but it did not seem to exercise any specific influence for good, and the same can be said of eserine. A compress bandage and a mild sublimate solution ($\frac{1}{4000}$) used every four hours, together with an occasional drop of a solution of atropia —1 per cent.—have given the best results. To this treatment the keratitis responds promptly, and in a week or ten days the subjective phenomena have been so ameliorated that the shucker can resume work. The opacity can be detected by oblique illumination and is permanent. In several cases where the shuckers had been struck more than once, I found the old nebulæ.

The striking point in these cases is the rapidity with which an area of infiltration makes its appearance at the site of the injury. These areas range in size from a pin's head to twice these dimensions, and even larger. The condition differs so entirely from what we are accustomed to see from injuries caused by other kinds of minute foreign bodies that it has occurred to me that the oyster shucker's keratitis might be due to some specific micro-organism. With this idea in view, I made microscopical examinations and inoculations on culture media, using chiefly nutrient agar, from sixty-five cases of oyster shucker's keratitis, of which the following fifteen cases may be taken as a fair sample of what the bacteriological examinations disclosed. In making inoculations a sterilized dropper and cocain solution were used for anæsthetizing the cornea. The point of the platinum needle was well forced into the necrosed tissue, and in nearly all cases small particles of the wall of the ulcer were brought away and carried into the agar tube. In every case Esmarch tubes were made, which were promptly placed in the thermostat.

F. H., struck in left eye three days ago. Central ulcer. Pain and photophobia intense. There was nothing visible in the cover slips, and after twenty-four hours there was no growth on the agar.

J. R., struck in right eye with particle of shell yesterday. Large ulcer and marked area of infiltration. Eye very painful. Inoculations into three agar tubes. Two cover slips were made, and one stained with methylene blue and the other with gentian violet. In both cover-slips small micrococci were to be seen, occurring as diplococci. In tube A there was a diffuse growth at some points the colonies looked round and flat, and an examination of several of the colonies showed the same organism, a short bacillus. There was no growth in tube B (inoculated from A). In a third tube where the inoculation was made directly from the ulcer there was an abundant growth of what was evidently an impurity.

J. H., struck in left eye three weeks ago. At the present time there is a slight keratitis with hypopyon collected in the anterior chamber. Two ulcers on the cornea. Cover slips from the ulcer showed nothing. In tube A there was a round, large and slightly iridescent colony with reddish centre and yellow halo, which was then inoculated into this tube. This strain shows to be an enormous micrococcus. In tube B the agar was dotted with a fine growth, the colonies being very numerous and revealing under

the microscope bacilli of at least three varieties. The inoculations were made into both tubes directly from the ulcer.

P. S., large ulcer in centre of left cornea from an injury received yesterday. Cover-slips showed nothing definite. In tube *A* there was a vigorous growth of several varieties of bacteria. In tube *B* (inoculated from *A*) there were two kinds of bacilli, one staining very deeply and having rounded ends, and the other bacillus being more slender and having sharply cut ends. Both these bacilli were present in tube *A*. Tube *C* contained nothing.

A. G., struck in left eye yesterday. Small central ulcer. Cover-slips negative. In tube *A* after twenty-four hours there was a small round white colony that turned out to be the staphylococcus pyogenes albus. There was no growth in tubes *B* and *C* (representing the first and second dilutions of tube *A*).

W. H. W., struck in left eye yesterday. Minute ulcer on the nasal side of the centre of the cornea. Cover-slips showed nothing. Tubes *A* and *B* contained numbers of small white colonies scattered over the surface of the agar, and examination showed them to be bacteria of various kinds and shapes. (*B* was inoculated from *A*.) Tube *C* was inoculated direct from the eye and contained two colonies of a long slender bacillus.

R. L., left eye, small central ulcer. Was struck yesterday. Cover-slips vague. Tube *B* inoculated from *A* contained a bacillus and large micrococcus. Tube *C* contained nothing.

T. W., struck yesterday. Central ulcer. Pain intense. Struck for the first time, though he has shucked oysters for fifteen years. Cover-slips and cultures negative.

C. L., struck in right eye yesterday. Large ulcer somewhat below the equator of the cornea. The staphylococcus aureus was found in this case.

G. J., struck in left eye six days ago. Small ulcer on periphery of the cornea. On the second day tube *A* was found to be dotted with small white colonies which turned out to be a short bacillus. This bacillus was also found in tube *B*. Nothing grew in tube *C*.

G. B., struck two days ago, and pain did not come on till he went home that evening and faced the lighted lamps in his house. The staphylococcus aureus and two varieties of bacilli were found in the agar, one a short heavy bacillus and the other a short slender bacillus.

J. B., struck three days ago in the left eye. Small central ulcer. Small colonies of two kinds of bacteria in tube *B* (inoculated from *A*). One of these was the staphylococcus aureus and the other was a large bacillus.

A. S., struck in right eye three days ago. Small ulcer nearly central. Struck in same eye a year ago. Has been shucking for eighteen years. Cover-slips vague, but in tube *C* there grew the staphylococcus albus and a bacillus. Three tubes made, tube *C* being second dilution of tube *A*.

F. R., struck three days ago in the left eye. Central ulcer. There was nothing on the cover-slips, and in both tubes *A* and *B* there was a large stumpy bacillus. *B* was inoculated from *A*.

W. J., struck in right eye yesterday. Large central ulcer. One of the cover-slips showed a large micrococcus that also was found in tube *B*. This tube was inoculated from *A*.

In eleven cases out of the sixty-five there was absolutely no growth on the agar. This is not surprising when we consider the very small surface or area from which the inoculations were made. I took particular care never to touch any part of the cornea but the ulcer, and as this always occupies a very prominent position on the cornea it is likely that most bacteria would be swept off into the conjunctival sac by the constant movements of the lids. In thirty-nine cases the bacteria were of various kinds, and there were no two cases presenting the same bacteriological conditions. As a rule bacilli were the predominating organisms, and usually they were

large and coarse. In three of the fifteen cases given in full I found the same bacillus, about the size of the bacillus subtilis, possibly somewhat shorter. I made a suspension of this organism in sterilized water and injected a few drops into the cornea and conjunctiva of a rabbit's eye, but scarcely any reaction followed. In several of the cases where there appeared to be some similarity between the organisms I tried the effect of injecting a suspension of the organism into the cornea, but always with negative results. In five cases the staphylococcus pyogenes aureus or albus was found. The injection of a suspension of this organism into the cornea was followed by suppuration, a thing, of course, to be expected. Inasmuch as the pyogenic staphylococci are found in several other external diseases of the eye, and even in the normal conjunctival cul-de-sac, to say nothing of their association with inflammation in other parts of the body, and moreover the fact that they were found in only five cases out of sixty-five, we are justified in the conclusion that the pus organisms had nothing specifically to do with the inflammation in those cases where they were discovered.

Were oyster shucker's keratitis a parasitic disease, certainly its specific organism, if recognizable by our present means of investigation, would have been found in several of the cases; but, as I have said, in only three cases did I find the same organism present, and the experiments with this organism seemed to show that it was possessed of slight, if any, pathogenic properties. It may be added that being once struck did not produce immunity, as there were several shuckers among the sixty-five who had been wounded twice in the same eye.

Is the disease of chemical origin? is there any chemical substance in the juice or shell that produces this immediate and intense reaction in the human cornea? To test this hypothesis I obtained about an ounce of the oyster juice, to which I added about a teaspoonful of the chippings from the shell and then passed this mixture through a Pasteur filter. I always made the oyster shucker open the oyster into a vessel so that I could obtain the juice fresh. This fluid after being filtered was injected from a sterilized hypodermic syringe into the cornea and conjunctiva of a rabbit's eye. Fifteen experiments of this character were made and the result in every case was negative, a fact that goes to show that in so far as the rabbit's cornea is concerned the juice of the oyster manifests no pathogenic effect when injected into that part of the eye.* In the first case I obtained a beautiful kerato-iritis in one eye, and in the other eye an ulcer not unlike the ulcer produced by the oyster shell. On examining the filtrate I found that it contained two varieties of bacteria—in other words, that it was infected. The injection, though, of these bacteria (both were bacilli) into the cornea of the rabbit was in no instance followed by a keratitis, so that the inflammation in the first case must have been due to some organism not found in the oyster. In the other fourteen cases I obtained a filtrate free from micro-organisms, and this filtrate was shown to possess no pathogenic properties when injected into the cornea of a rabbit.

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* It may be well to state that in only one or two series of experiments did I use the same filtrate. Fresh juice was obtained and filtered for every experiment.

The bacteriological study of these cases would seem to indicate that the so-called oyster shucker's keratitis is not of parasitic origin. A number of experiments with the oyster juice after the latter has been freed of its living organisms goes to show that the juice of the oyster probably has nothing to do with the causation of the keratitis seen among oyster shuckers, and furthermore that the injection of this juice, even as much as a syringeful, under the skin of a rabbit was in no case followed by inflammation. Nor when the unfiltered juice was injected into the cornea was it followed by any irritating effect. It remained to be seen whether there was any chemical ingredient in the shell capable of calling forth this inflammation.

Several fresh oysters were procured and the edges were chipped off and ground up fine. The edge of the shell was selected, as it is this part that is chipped off by the shucker. These particles were then sterilized in a test tube. The heat did not seem to alter the size of the particles. The reaction of this substance was decidedly alkaline. I made a very small wound in the cornea of a rabbit with a cataract knife and rubbed in gently with a platinum needle a few particles of the powder. This experiment was performed eighteen times and in every case I succeeded in getting a well defined ulcer. The ulcer was accompanied with little or no circumcorneal injection, and its edges were sharply cut and separated from the healthy cornea. These experiments show beyond a doubt that there is something in the oyster shell that when introduced into the cornea will produce keratitis.

It is difficult to imitate successfully all the conditions connected with a foreign body in the cornea. In the first place, the size of the foreign body is problematical, and the most difficult thing to imitate is the manner and force with which it strikes the cornea. I thought that it would be possible to approach this latter condition by using what the boys call a blow-gun or spit-blower. It was seldom that I succeeded in blowing the particles of shell with force sufficient to drive them into the cornea. Twelve experiments of the following character were performed. One long blower was loaded with cinders from a locomotive smoke-box, and another blower was loaded with particles of oyster shells. Both the cinders and shells were sterilized. At a distance of six inches from the cornea the load was blown into the latter. In a few cases a cinder remained sticking in the cornea, but in only one case did a particle of shell stick; the particles of shell were too fine to be blown with force sufficient to make them lodge on the cornea. It was noticeable, though, that the reaction was more or less intense in the eye into which the shells had been blown, while there was practically no reaction in the eyes into which the cinders had been blown. In the case of the eyes where the shell was used, redness of the conjunctiva and increased secretion were seen, while in the other class of cases the conjunctiva remained normal. The reason that I failed to get an ulcer was that I never succeeded in wounding the cornea to any extent.

It could hardly be expected that the reaction in the case of a rabbit's cornea would be as intense as that following similar injuries in man. I have always been impressed with the promptness with which injuries to the eyes of dogs and rabbits heal. Injuries that, in the case of human beings, necessitate long and careful treatment, get well readily in rabbits and dogs. Spontaneous affections of the rabbit's conjunctiva are comparatively rare. This is not the case to the same extent with dogs, which, like man, are not infrequently seen with eye affections. The tissues, too, of a rabbit's eye are certainly more resistant to infected wounds than those of man. This fact I have demonstrated elsewhere again and again. It is not likely then that we would get a keratitis in a rabbit that resembled exactly what we are accustomed to see in the oyster shucker. The keratitis in the shucker would be more intense in its clinical history, simply because it is the human cornea that is affected; this intensity being due perhaps to the frequent presence in the conjunctival sac of pathogenic bacteria, and to the feebler resisting powers of the tissues.

It is reasonable to suppose then that any agent that will produce an ulcer in a rabbit's cornea will certainly have the same effect on the human cornea. It has been shown that, with the exception of the pus organisms, none of the organisms found in the sixty-five cases of oyster shucker's keratitis produced keratitis when injected into the cornea, that is to say, there was no apparent infiltration of the cornea at the point of injection; and this, added to the fact that no one organism was found constantly present, inclines one to the opinion that the disease is probably not of bacterial origin—this in the light of our present bacteriological knowledge. It has been shown that the oyster shell contains an inorganic material that does produce keratitis when introduced into the corneal tissue.

The analysis of Chatin and Muntz* shows that the shell of the oyster contains considerably over 90 per cent. of calcium carbonate. The analyses show that carbonic acid held in combination with calcium and magnesium is present to the extent of 44 to 48 per cent., and that calcium oxide varies from 49 to 53.7 per cent., and magnesium oxide from 0.4 to 0.5 per cent. The tables further show that sulphates, phosphates, silicates, fluorides, bromides and iodides are present, the sulphates forming about $1\frac{1}{2}$ per cent., the phosphates $\frac{1}{10}$ per cent. and less, the silicates 2 to 3 per cent. and more, the fluorides a few hundredths of 1 per cent., the bromides and iodides some thousandths only of 1 per cent. The bases corresponding are calcium, magnesium, iron and manganese. Organic matter is present to the extent of 1 per cent., and remains in the form of a thin membrane or network when the mineral matters are dissolved out of the shell with the help of acids. It will be seen then that the carbonate of lime forms nearly all of the oyster shell.

I obtained some pure carbonate of lime (not the chalk such as is furnished by the druggist), and after making a sterilized wound of the cornea, powdered some of the lime that had been previously sterilized, between the lips of the wound, and in every instance I succeeded in getting an appreciable keratitis. This experiment was repeated with positive results a number of times. It would seem then that the carbonate of lime is in itself sufficiently irritating to call forth an inflammation of the cornea under certain conditions.

* Analyse des coquilles d'huîtres, par MM. A. Chatin et A. Muntz, Comptes Rendus, t. CXX, 53.

In this connection it is interesting to note the fact that on the Eastern Shore of Maryland, in the latter part of September and during October, when the winds are very high and the roads dusty, a form of ophthalmia is very common, which is attributed to the fine particles of oyster shell dust that fill the air and get into the eyes of those who drive along the roads. The roads in that section are for the most part shell roads. The ophthalmia is characterized by great redness of the conjunctiva and profuse secretion. Not infrequently both eyes are affected, and it is a very painful affection. I am indebted to Dr. B. W. Goldsborough of Cambridge for information on the subject of this interesting eye disease, which he tells me is often seen in his section of the country at certain seasons. This certainly shows that the oyster shell possesses irritating qualities. Accounts are contradictory as to the irritating effect of the dust on a well-known shell road in the vicinity of Baltimore.

It has been suggested that the mud which covers the oyster probably flies into the eye and causes the trouble. Any one who has visited an oyster shucking establishment will be struck at once with the appearance of the shuckers. Their hats, faces and the upper portions of the body are peppered with fine particles of mud, and I have been told over and over again that the mud frequently flies into the eyes, but other than a little temporary burning no inconvenience follows. The face is often the seat of hundreds of little points where a drop of mud has struck and hardened. I am sure that were the injury inflicted in this manner we would meet with the disease far oftener, in fact oyster shucker's keratitis would be a very common affection, but it has been shown that the disease is of exceptional occurrence.

As to any other ingredient of the oyster shell playing a role in the production of the keratitis I am unable to give any evidence at this time. Positive evidence exists to show that the carbonate of lime possesses properties irritating enough to produce keratitis in the cornea of rabbits and dogs, a keratitis of a sluggish character. And though no typical picture of oyster shucker's keratitis was obtained in these animals, it is highly probable that the peculiar aspect of the disease as seen in man is due to conditions belonging to the human eye alone, conditions which help to intensify the process. It is more than likely that some one or more of the other chemical ingredients of the shell may play a part in the etiology of the keratitis. From the analysis of Chatin and Muntz it is evident that the oyster shell contains ingredients besides the carbonate of lime which might be irritating to the cornea and conjunctiva.

CONCLUSIONS.

1. Oyster shucker's keratitis may be defined as a traumatic keratitis where the injury is produced by a particle of the oyster shell.

2. The disease is chiefly remarkable for the rapidity with which the cornea undergoes necrosis at the site of the injury, this area of necrosis being usually very small, owing no doubt to the small size of the foreign body. Small foreign bodies of copper, steel and sand usually produce no appreciable keratitis; and even when they lodge in the cornea, commonly require several days to cause a noticeable inflammation. On the other hand, the oyster shucker presents a marked infiltration of the cornea at the point of injury within twenty-four hours after the accident.

3. This decided reaction on the part of the cornea makes the injury a peculiarly dangerous one when a large area is wounded, or when entrance has been made into the anterior chamber, such conditions in my experience being invariably followed by loss of the eye through panophthalmitis. How often do we see the cornea injured in the same degree by other kinds of foreign bodies and still the vision not entirely destroyed.

4. Bacteriological investigations failed to discover any specific organism, nor did any of the organisms obtained from cases of oyster shucker's keratitis manifest any pathogenic properties when introduced into the corneæ of rabbits, with the exception of the pyogenic cocci. It is not likely then that the disease is of parasitic origin.

5. The carbonate of lime, of which the oyster shell is almost entirely composed, was found to possess qualities irritating enough to call forth a keratitis when introduced into the cornea of a rabbit, and it is more than probable that several other chemical ingredients of the shell would be more or less irritating to the cornea.

6. It is certain that bacteria always play a part in traumatic keratitis, but it is evident that in this variety of traumatic keratitis the cornea is rendered especially susceptible to the effects of micro-organisms, by the irritating chemical ingredients of the oyster shell, notably the carbonate of lime.

THE CLINICAL COURSE OF FORTY-SEVEN CASES OF CARCINOMA OF THE UTERUS SUBSEQUENT TO HYSTERECTOMY.

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The doubts which have existed as to the ultimate value of complete extirpation of the uterus for carcinomatous growths can be set aside with certainty. From the statistical reports of many operators we are now justified in claiming the possibility of cure in a certain number of cases by removal of the uterus, or a relief from distressing symptoms for months and even years. We obtain then by such a procedure either a cure or a palliative effect, very often anticipating a cure where we obtain only cessation for a variable period of the local discharges, hemorrhages and pain.

It is commonly accepted that these patients live usually not over two years after the appearance of the first local signs.

If we are able then to free them from this terrible affliction for a longer time than this, even though recurrence does result in the end, are we not justified in the procedure? The indication for operation is to obtain a cure, although ultimately there may be only temporary relief.

Our results clearly illustrate this fact, as sixteen of the twenty-one cases still living have passed the limit of two years and are enjoying good health—a period of exemption well worth the trial.

The following forty-seven cases of hysterectomy for carcinoma of the uterus include all those operated upon by Dr. Kelly and myself since the opening of the Gynecological wards in October, 1889, and in Dr. Kelly's private practice up to October, 1895, thus giving a time limit of from one to five years.

Many of these cases we have seen personally within the past three months, and where they lived at a distance we have obtained our information by writing to the local consultant or to the patients themselves.

Vaginal hysterectomy has been employed in forty cases, abdominal in four, and the combined operation in three cases.

Grouping them all under one head the results are as follows:

Death from primary effect of operation...... 5 = 10 per cent.
Patients still living .... 21 = 44   "
Patients died with recurrence .... 16 = 34   "
Patients not heard from .... 4 = 8   "
Died from heart lesion.......... .... 1 = 2   "

Three of the deaths immediately following the operation were due to peritonitis and two to ligation of the ureters.

Recurrence and death took place in the sixteen cases within eighteen months, but the prognosis in eight of these at the time of operation was unfavorable.

One patient of the twenty-one still living was operated upon nearly five years ago for extensive disease springing from the cervix. She presented herself in perfect health about every six months for examination, but we were never able to find any return of the trouble locally. About sixteen months ago there appeared in the left side of the neck above the clavicle a nodule, to which she called our attention. Since then other glands in this region, on the opposite side of the neck and in the axillæ, have become similarly affected, some of which have broken down and discharged externally. She is at present in a critical condition. As her home is at a considerable distance, we are compelled to accept this as a metastatic manifestation.

Two cases died within four months after the uterus was removed. One had at time of operation such extensive infiltration on either side of the cervix that the case was considered hopeless. The uterus in the second case was found during the operation converted into a friable carcinomatous mass adherent in every direction to the bowels, so that complete enucleation was impossible.

Carcinoma of the breast developed and was removed in two cases several months after the uterus was extirpated. One of these died of a pre-existing heart lesion without any evidence of a local return, and the other is at present also free from any pelvic trouble, but the carcinoma has again appeared in the breast.

The Fallopian tube prolapsed in three cases in which it had not been removed, and during the healing of the vaginal incision was caught so that it protruded into the vagina, greatly reddened and swollen. These upon examination made us suspicious that there had been a return of the disease, but the microscope proved their true character. Two of these patients are still in good health; the third died from a recurrence.

Another patient returned a year after operation with a note from her physician telling me that he had discovered a mass in the vaginal vault which he believed to be of a malignant character. There had been associated with it a profuse vaginal discharge, and occasionally some bleeding. This mass proved to be a large silk ligature which had been left on the broad ligament and had become imbedded in the granulation tissue. Since the removal of the ligature the patient has been absolutely well.

The most interesting of these cases is a patient who presented herself three months after vaginal hysterectomy for carcinoma of the cervix, with a fungus-like growth arising in the vaginal vault along the scar resulting from the operation. Dr. Kelly dissected the mass carefully out and thoroughly cauterized the surrounding area. This took place two and a half years ago, and the patient at present continues to be in excellent health.

Local return occurred in all the cases terminating fatally, but in none could we elicit any history of metastatic growths in other parts of the body, the single exception being the one case above cited where the patient is still living.

Pneumonia was the cause of death in one instance thirteen months after the operation; here there was an extensive malignant ulcerated area in the vaginal vault, which had appeared a few months after she left our care.

Adeno-carcinoma, body of the uterus .... 9 cases.
Carcinoma, cervix ....

Results of hysterectomy for carcinoma of the body:

Patients still living   ....
   "   died recurrence, operation incomplete.......... .... 1 = 11
   "   died primary effect of operation...... 1 = 11
No. cases still living, 5 yrs. elapsed 1

The uterus was removed by supravaginal amputation in three cases. .... vaginal hysterectomy .. .. in the remaining six. ... ... cases in which the cervix was left have proved as satisfactory as those .. which the .. .. removal.

Results in hysterectomy for carcinoma of the cervix:

Patients died from primary effect of the
   operation ....   4 = 10 per cent.
Patients still living .... 14 = 36   "
Patients died with recurrence......... .... 15 = 38   "
Patients not heard from .... 4 = 10   "
Operations over 4 years ago and patients still living........... 3
     ..   3   1
     ..   2   1
     "   1   "   "   "   3

The uterus was removed in four cases by the combined method. One of these died a few days after the operation from ligation of the ureter, and another in which the disease was associated with pregnancy died several months after operation with a recurrence in the vagina. The remaining two are reported as free from any suspicious signs.

Vaginal hysterectomy was employed in thirty-four cases, three of which died from the operation, and fourteen afterwards from the original disease.

The four cases not accounted for up to the present time were considered at the time of operation favorable for cure. Two of them I have since seen, one two years after operation and the other one year, and both at that time showed no evidence of ulceration or induration by vaginal examination.

The fourteen women who are still living do not give symptoms pointing to metastasis or local recurrence, except the one mentioned with the nodules in the neck and axillæ. This single case proves that even after a lapse of four years we are not justified in claiming a cure. We cannot definitely at present fix a period of years through which a patient must live in order to pass the danger limit. Fritsch, Schauta, Hofmeier, Leopold and Boldt have followed their cases from

five to seven years after the removal of the uterus, and even as late as seven years there continues to be a fall in the percent. of cures.

Olshausen, Schauta and Fritsch report over 47 per cent. without recurrence after a lapse of two years. It is a striking fact that in our cases thus far, all recurrences but one have taken place within eighteen months.*

We have not attempted to show the relationship of the different forms of carcinoma to their tendency to recurrence, but the form of disease has undoubtedly a great influence upon the ultimate results. This point is clearly demonstrated by our experience, as in not a single one of the seven cases in which the uterus was completely removed for adeno-carcinoma of the body has a recurrence been noted; while in the thirty-eight cases where the cervix was diseased, fifteen have died with a return of the trouble.†

Metastases were found only once beyond the pelvic and retroperitoneal glands, in ten autopsies performed in the pathological laboratory upon patients in whom carcinoma of the uterus was present. This was an adeno-carcinoma of the body of the uterus, and a few nodules were found in the liver. In four others there were carcinomatous deposits in the pelvic and retroperitoneal glands.

This, in conjunction with the fact that by far the greater majority die subsequent to hysterectomy with a continuation of the growth in the vagina and parametrium, proves the possibility of complete eradication.

* Statistics obtained from Winter, Berliner klin. Wochenschrift, 1891, No. 33, and Ztsch. f. Geburtsh. u. Gyn., Vol. XXIV, p. 135; also Boldt, American Jour. Obstet., Vol. 26, p. 517.

† Kinkenburg (Ztsch. f. Geburtsh. u. Gyn., Vol. 23) and Hofmeier (same journal, Vol. 32) have made similar observations.

STATISTICS OF FORTY-SEVEN CASES OF CARCINOMA.

NAME.	SEAT OF DISEASE.	OPERATION	DATE OF OPERATION.	DATE OF DEATH.	REMOTE RESULTS.
Mrs. L.	Cervix. Fungating mass filling upper portion of vagina.	Vaginal hysterectomy.	11-21-89	8-30-91	Local return.
E. C.	Body.	Vaginal hysterectomy. Uterus ruptured during removal.	1-2-90		Patient continues to be in excellent health.
C. G.	Cervix. Previous operation, high amputation.	Vaginal hysterectomy. First use of ureteral catheter.	6-18-90		Patient last examined 10-2-93. No sign of return.
D. J. B.	Body.	Vaginal hysterectomy. Bladder opened.	8-28-90	Five days after operation.	Death, peritonitis.
Mrs. H.	Cervix. Extensive lateral infiltration.	Vaginal hysterectomy.	3-28-91	Five months after operation.	Local return in vaginal vault.
M. W.	Cervix. Fungating mass in vagina.	Vaginal hysterectomy.	4-4-91		Last examination 10-2-95. No evidence of return.
J. B.	Portio vag. Disease extends 1 cm. on vaginal walls.	Vaginal hysterectomy.	5-4-91		Discharging glands in neck and axillæ. No local return, 8-15-95.
E. C.	Cervix. Disease circumscribed	Vaginal hysterectomy.	7-1-91		Last seen 8-9-93. In perfect condition.
M. A. B.	Cervix. Fungating mass in vagina. Extensive lateral involvement.	Vaginal hysterectomy.	11-9-91	9-5-92	Local return in few months.
Dr. Miller's Patient.	Cervix.	Vaginal hysterectomy.	4-22-91		Excellent health. No evidence of return, 9-11-95.
Mrs. W.	Cervix. Lateral involvement. Myoma at fundus.	Vaginal hysterectomy.	12-23-91	1-1-93	Local return.
K. K.	Cervix. Extensive lateral infiltration.	Vaginal and abdominal.	1-30-92	Died from operation. Ligation of ureters.	
Mrs. M.	Cervix.	Vaginal hysterectomy. Cauterization of left pedicle on account of infiltrated area. Prognosis bad.	2-18-92		Patient in excellent health. No local return, 9-15-95.

NAME.	SEAT OF DISEASE.	OPERATION.	DATE OF OPERATION.	DATE OF DEATH.	Later Records.
Miss B.	Body.	Incomplete vaginal hysterectomy on account of extensive disease and infiltration of fundus.	2-24-92	About three months after operation.	Disease had broken through uterine wall and spread out on intestines.
Mrs. G.	Cervix.	Vaginal hysterectomy.	8-3-92		9-28-92. Portion of tube in incision removed with cautery. 9-1-95, pa-
F. C.	Cervix. Two nodules found in uterus entirely separate from cervix.	Vaginal hysterectomy. Bladder perforated and afterwards closed with good result. Bad prognosis.	11-27-92	10-18-93	12-12-95. Prolapsed tube excised. Local
C. T.	Cervix. Complicated by 4 months' pregnancy.	Vaginal and abdominal.	11-10-92	5-1-94	Patient died in Hospital. Local return with perforation of bladder and rectum.
R. A.	Body. Associated with myoma.	Supra-vaginal amputation. Cervical canal cauterized.	11-28-92		Patient in good health, 9-13-95.
Z M. S.	Cervix. Fungating mass in vagina.	Vaginal hysterectomy.	12-17-92		5-13-93. Ulcerated area in vaginal vault dissected out and cauterized.— 9-31-95. No sign of local return.
A. E.	Cervix. Fungating mass filling vagina. Invasion of vaginal mucosa.	Vaginal hysterectomy.	6-25-93		Unable to find patient.
Mrs. D.	Cervix.	Vaginal hysterectomy.	3-6-93		Patient continues in good health, 10-1-95.
Mrs. C.	Cervix.	Vaginal hysterectomy.	4-12-93		Unable to obtain information regarding patient.
Mrs. G.	Cervix.	Vaginal hysterectomy. Impossible to remove all disease laterally.	4-18-93	7-1-93	Local return.
E. B.	Body.	Vaginal hysterectomy. Uterus ruptured in removing.	5-10-93		Breast removed for cancer about one year after hysterectomy. 10-1-95, no return in vagina, but patient under treatment for some recurrence in breast.
Mrs. S.	Cervix.	Vaginal hysterectomy.	8-30-92	Died one year later.	Local return.
S. L.	Cervix. Vagina filled with fungating mass, and infiltration for 2 cm. about cervix.	Vaginal hysterectomy. Bladder perforated. Transfusion of salt solution in radial artery.	10-10-93	8-15-94	Local return.
P. H.	Cervix. Circumscribed nodule.	Vaginal hysterectomy.	11-8-93		Last heard from 8-20-95. Doubtful re-
L. W.	Body. Associated with myoma.	Supra-vaginal amputation.	2-15-93		Continues in excellent health, 10-5-95.
C. S.	Cervix.	Vaginal hysterectomy.	11-25-93	Died from operation. Peritonitis.	
M. F. W.	Portio vaginalis. Disseminated nodules in vaginal mucosa.	Vaginal hysterectomy. Whole upper third of vaginal mucosa removed.	11-25-93	2-1-95	Death from pneumonia. Local return.
M. G.	Body.	Vaginal hysterectomy.	12-4-93		Continues to be in excellent health. 8-17-95.
M. D.	Cervix. Lateral infiltration so far advanced that a bad prognosis given.	Vaginal hysterectomy. Bougie in ureter.	12-11-93		No evidence of local return. Patient in excellent health, 9-13-95.
A. R.	Cervix. Post. lip only involved.	Vaginal hysterectomy.	1-31-94		Sent by physician for examination on account of suspicious nodule in scar, which proved to be silk ligature imbedded in granulation tissue. No evidence of return of disease. 9-13-95.
L. W.	Cervix. Fungating mass filling upper portion of vagina. Mucosa of vagina not diseased.	Vaginal hysterectomy. Bougie passed into ureter.	2-15-94	About nine months after operation.	Local return.
N. C. J.	Cervix. Uterus torn off above internal os. Lateral infiltration. Bad prognosis.	Vaginal hysterectomy.	2-17-94	6-3-94	Local return.
E. O.	Cervix. Lips entirely disappeared. Disease far advanced laterally.	Vaginal hysterectomy. Uterus ruptured during removal.	3-3-94	11-5-94	Local return.
S. B. H.	Cervix. Nodules felt beneath vaginal mucosa. Prognosis bad.	Vaginal hysterectomy. Bougie in ureter. Pus cavity beside uterus in abdomen.	3-5-94	Five months after operation.	Local return. Death sudden.
M. E.	Cervix. Vagina and parametrium involved. Bad prognosis.	Vaginal hysterectomy. Nodule in broad lig. dissected out.	3-5-94	Eight months after operation.	Local return.
M. H.	Cervix.	Vaginal hysterectomy.	3-7-94	Died from operation.	Death from peritonitis.
M. Q.	Cervix.	Vaginal hysterectomy.	8-21-94	Died from operation.	Death from peritonitis.
B. Z.	Portio vaginalis. Disease had encroached upon vaginal walls 2 cm.	Vaginal hysterectomy. Ureter cut.	8-22-94		incision in bladder. 8-15-95, no sign of return. No urinary difficulty.
M. P.	Body.	Abdominal hysterectomy.	7-25-94		Perfect health when last seen, 8-18-95.
A. R.	Cervix.	Combined operation, vaginal and abdominal.	8-8-94		No local induration or ulceration.
S. A.	Cervix. Converted into shell.	Combined operation, vaginal and abdominal.	6-5-94		
K. A.	Body.	Supra-vaginal amputation. Cervix cupped out.	6-20-94		No local
S. C.	Cervix.	Vaginal hysterectomy. Tube caught in vaginal incision.	2-17-94		
Mrs. W.	Cervix.	Vaginal hysterectomy.	11-15-92	Died from pulmonary embolism.	Patient died of heart lesion.

NOTES ON SOME CASES OF ANGINA TREATED WITH BEHRING'S ANTITOXINE.

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The following cases of angina, either due to the bacillus diphtheriae, or simulating true diphtheria and due to other organisms, have been observed in the hospital since the intro-duction of the antitoxine treatment.

Some of the cases are of interest as relating to the effect of the antitoxine on diphtheria; others were not treated by anti-toxine, but present some special point of interest bearing more or less upon diphtheritic or diphtheroid inflammations.

In the cases treated by antitoxine, the preparation prepared under the direction of Behring was exclusively used, the vari-ous strengths being indicated according to the severity of the case and regardless of the age of the patient.

The antitoxine was usually injected into the cellular tissue of the back, though occasionally into the musculature of the thigh, the injection being done with a syringe previously sterilized by boiling, the skin of the part to be injected having been prepared by the methods usual before operative pro-cedures.

The cases, which number eighteen, may be grouped under the following heads:

Membranous Angina due to the Bacillus Diphtheriae.

Case 1.—Female, aged 11, white. Admitted to the hospital December 31, 1894, complaining of sore throat.

History.—The family history is negative. The patient had measles, whooping cough and typhoid fever as a young child.

The present illness began four nights ago, the patient waking up in the middle of the night with an attack of nausea, fol-lowed by vomiting and headache. The throat did not feel sore until the following night, and she then noticed pain on swal-lowing. At first the soreness was confined to one side, but later both sides became involved.

On admission the general condition was good. There was great swelling of both tonsils, the glands almost meeting in the median line. The inner surface of each tonsil was lined by a purulent membrane, which, on removal, left a bleeding surface.

January 1. The membrane has extended to the uvula and soft palate. There is slight glandular swelling on the left side.

January 2. The child looks rather pale and is dull and apa-thetic. Behring's Antitoxine No. 3 was injected into the sub-cutaneous tissue of the back.

January 3. The child is much brighter, states that she feels better, and voluntarily asks for food. The swelling of the ton-sils has diminished, though the uvula is still covered by mem-brane. The tense oedema of the tonsils and adjacent parts observed yesterday has disappeared.

January 4. The membrane has almost disappeared.

The temperature on admission was 101.5° F., and ranged between this point and 103° F. up to the time of the inoculation, when it was 103° F. Following the inoculation it sank grad-ually; the morning following it was 100.5° F., but after this never passed above 100° F., the convalescence being uninter-rupted.

The pulse was noted to be a little feeble the day on which the inoculation was made; the following morning it was much improved. About six days after the inoculation the patient began to have attacks of urticaria, coming and going over a period of a week. The eruption was not confined to the region of the original injection, but occurred in various parts of the body.

Bacteriological Examination.—Cover-slips from the throat did not show definite diphtheria bacilli.

Cultures after 24 hours showed almost a pure culture of the bacillus diphtheriae.

A guinea-pig inoculated with a 24-hour bouillon culture died 14 days later with characteristic lesions, diphtheria bacilli being obtained from the seat of inoculation.

Case 2.—Female, aged 35, white. Admitted to the hospital January 7, 1895, complaining of sore throat.

History.—Her father died of some disease of the liver, her mother of heart disease. No other diseases in the family.

As a child she had the usual exanthems. She had an attack of diphtheria at 9 and another at 29, the latter being a severe attack. She has had four attacks of tonsillitis in the last three years.

The present illness began with a feeling of malaise three days ago; the following day she had chilly feelings and pain in the limbs and back. The throat was not noted to be sore till yes-terday.

On admission the general condition was good. There was a general reddening of the throat and a large patch of grayish-white membrane over the left tonsil, which was detached with difficulty and left a bleeding surface.

Behring's Antitoxine No. 1 was injected into the muscles of the back.

January 8. The membrane on the left tonsil remains the same. There is a small patch on the right tonsil which was not noticed yesterday.

January 10. The membrane has completely disappeared.

The temperature on admission was 100.5° F. At the time of the inoculation, two hours later, it was 101.5° F., and had risen two hours later to 102° F. The following morning it had fallen to 100° F., but rose again slightly, reaching 100.5° F. at 4 P. M.; from this time on it fell, reaching normal in four hours and never again rising above that point. The pulse was good at all times. No skin eruption was observed.

Bacteriological Examination.—Cover-slips from the throat showed typical diphtheria bacilli. Cultures on blood serum showed many colonies of the bacillus diphtheriae and a few of the streptococcus pyogenes.

An animal inoculated with a 24-hour bouillon culture failed to react either locally or constitutionally.

The organism isolated was certainly not the pseudo-diphtheria bacillus. It acidified litmus bouillon, and grown side by side with a culture of the pseudo-bacillus, could easily be distin-guished. The patient was discharged seven days after the dis-appearance of the membrane, the bacilli still being present in the throat.

February 17. The patient again comes under observation after a five weeks' holiday. The throat is quite clear. She states that during her absence, and about three weeks after the cessa-tion of the first attack, she had a second fairly severe attack of sore throat, which was diagnosed tonsillitis by the attending physician, but without a bacteriological examination.

Cultures were again from the throat, and diphtheria bacilli and streptococci found to be present.

The patient was kept under observation, and three days later cultures were again taken, the patient having used at frequent intervals for the preceding 24 hours a bichloride spray and a solution of hydrogen peroxide as a gargle. Large numbers of diphtheria bacilli were still present.

Two days later a third set of cultures were made, the patient in the meanwhile having had Löffler's toluol solution vigor-ously applied to both tonsils five or six times. The diphtheria bacilli were still present, though in smaller numbers.

These organisms, like those isolated in the first attack, were harmless for animals, so the patient was allowed to return to her work. Three weeks later she was again admitted to the ward with a history of having been taken with sore throat, fever and malaise four days previously. She had been attended

for a time by her own physician, and creosote had been applied
locally. On admission there was a glossy white membrane over
each tonsil, very tenacious in character. The patient was prac-
tically convalescent at this time. The membrane gradually dis-
appeared and had entirely gone seven days from admission.
There was no fever.

In the interval between the first and last attacks, and in the
last attack, the diphtheria bacillus could always be obtained
from the throat. It was on several occasions inoculated into
animals and never produced either local or general reaction.

The organisms finally disappeared from the throat three days
after the disappearance of the membrane caused by the last
attack, or three months and three days from the beginning of
the first attack.

Case 3.—Female, aged 8, white. Admitted to the hospital Feb-
ruary 1, 1895, complaining of sore throat.

History.—The family history is negative. She has had the usual
exanthems and has been treated for some chronic throat disease
since August last.

The present illness began five days ago with a shaking chill
lasting about half an hour. She felt well the next day until
evening, when she had some fever. She complained of sore
throat from the first.

On admission the general condition was good. The right tonsil
was swollen and covered by a large patch of yellowish-gray
membrane; the left tonsil also swollen and shows a smaller
patch of membrane; the uvula free.

Behring's Antitoxine No. 2 was injected into the subcutaneous
tissue of the back.

February 2. The membrane is still present, but looks swollen
and has a shining translucent appearance.

February 3. The edges of the membrane are curling up.
There is a fine pink papular eruption over the face and back,
not itchy.

February 5. All the membrane has gone but a small patch
over the right tonsil. The eruption has disappeared.

February 8. The child complains of itching of the back. There
are ten to twelve urticarial wheals about the seat of inoculation.

February 9. The urticaria has disappeared.

The temperature on admission was 101° F., but had fallen to
99° F. when the inoculation was made; it never again passed
99.3° F. The pulse was always satisfactory.

Bacteriological Examination.—Cover-slips from the membrane
shewed a fair number of typical diphtheria bacilli. Cultures
showed the same organism in an almost pure state.

A guinea-pig inoculated with a 24-hour bouillon culture died
76 hours later, the autopsy showing the typical lesions of experi-
mental diphtheria, and the organism being recovered from the
seat of inoculation.

The organism disappeared from the throat five days after the
disappearance of the membrane.

Case 4.—Female, aged 30, white. Admitted to the hospital
February 5, 1895, complaining of sore throat.

History.—The family history is unimportant. The patient had
the usual exanthems as a child. She has had two attacks of
appendicitis, the last one two years ago. She had right-sided
pleurisy 20 months ago. Since the age of 15 she has had nine
or ten attacks of tonsillitis, none of them very severe.

The present illness began two days ago with chilly feelings,
which lasted for twenty-four hours. Last night she began to
have frontal headache, which persisted up to a short time ago;
all day yesterday she had pains through the limbs. The throat
felt a little sore from the first.

On admission the general condition was good. The fauces and
tonsils were slightly congested, the tonsils quite swollen, espe-
cially the right, which was almost covered with a patch of
yellowish-gray adherent membrane; a smaller patch was present
on the left tonsil.

Behring's Antitoxine No. 3 was injected into the subcutaneous
tissue of the back. In the afternoon some pain at the seat of
inoculation was complained of.

February 6. The patient feels much better. There is still
some pain at the seat of inoculation. The throat is less swollen,

though the patch on the left tonsil is somewhat increased in
size.

February 7. The throat is almost clear; what membrane
remains is swollen and pearly looking.

February 8. The membrane has entirely gone.

The temperature on admission at 2 P. M. was 102° F.; at
6 P. M., about two hours after the inoculation, it had risen to
102.5° F.; it then fell, reaching 99° F. at 8 the following
morning. At 12 noon on the 6th the temperature was 100° F.;
it then fell gradually, reaching normal at midnight and never
again going higher than 99.6° F.

The pulse ranged from 76 to 106; it was always strong.

No skin eruption was noted.

Bacteriological Examination.—Cover-slips from the membrane
showed typical diphtheria bacilli. Cultures showed the same
organism associated with the staphylococcus aureus and a few
streptococci.

A guinea-pig inoculated with a 24-hour bouillon culture showed
marked local tumefaction, but did not die.

The diphtheria bacillus disappeared from the throat 22 days
after the disappearance of the membrane.

Case 5.—Male, aged 26, white. Admitted to the hospital
March 6, 1895, complaining of sore throat.

History.—Aside from a history of tuberculosis in two sisters
the family history was negative. The patient had the usual
exanthems as a child, and malaria and typhoid as an adult. He
has been subject to attacks of sore throat ever since childhood,
some of these attacks having been severe enough to confine
him to bed.

The present illness began three days ago with dryness and,
later on, soreness of the throat. No chill or fever. He has head-
ache and pains through the limbs.

On admission the general condition was excellent. Both the
tonsils were swollen and reddened, and the middle part of each
was covered by a thick yellowish membrane, which, on being
detached, did not cause bleeding. The neck glands were a trifle
enlarged and tender.

Behring's Antitoxine No. 2 was injected into the subcutaneous
tissue of the back.

The membrane gradually disappeared and was entirely gone
three days after admission.

The temperature on admission was 99.5° F., and never again
passed above 99° F. The pulse was always satisfactory.

No skin eruption was noted.

Bacteriological Examination.—Cover-slips from the membrane
a few typical diphtheria bacilli. Cultures gave an almost pure
growth of the same organism.

A guinea-pig inoculated with a 24-hour bouillon culture died
48 hours later, the autopsy showing typical lesions of experi-
mental diphtheria, and the bacillus being recovered from the
seat of inoculation.

The organism disappeared from the throat three days after
the disappearance of the membrane.

Case 6.—Male, aged 24, white. Admitted to the hospital
March 10, 1895, complaining of sore throat.

History.—The family history is negative. The patient had the
usual exanthems as a child and is subject to sore throat as an
adult. He has always been subject to attacks of tonsillitis.

The present illness began two days ago with soreness in the
region of the left tonsil and chilly sensations. The attack began
in the evening, and by morning a small patch of membrane was
noticed on the left tonsil. On removing the membrane a bleeding
surface was exposed.

On admission the general condition was good. The tonsils
were swollen, and over each was a thick yellowish membrane removed by
the use of Loeffler's blood-serum, beneath the surface a good
tenderness could be seen still. The glands the neck were
slightly enlarged.

Behring's Antitoxine No. 3 was injected into the subcutaneous
tissue of the back.

Two days after the inoculation the temperature had become dis-
appeared, though the tonsils still looked a little red.

The temperature on admission was 98.5° F.

ing it had fallen to 99.5° F., and did not rise above 100.5° F. all that day. The following day it began to rise at 8 A. M., reaching 103.5° F. at noon, after which it fell gradually, being 99.5° F. at 8 the next morning and never again passing the normal. The pulse was always good.

No skin eruption was noted.

Bacteriological Examination.—Cover-slips from the throat showed a fair number of typical diphtheria bacilli. Cultures showed an almost pure growth of the same organism.

A guinea-pig inoculated with a 24-hour bouillon culture showed a marked local reaction, but did not die.

The bacilli were still present thirteen days after the membrane disappeared, though not virulent.

Case 7.—Male, aged 5, white. Admitted to the hospital June 13, 1895.

History.—Could not be obtained.

On admission it was noted that the child was small and ill-nourished. The skin was pale. The mucous membranes not cyanotic. The respiration was loud but not stridulous. There was a constant purulent discharge from the nostrils, and much muco-pus dribbled from the mouth. Membrane could be made out on the soft palate, but examination of the tonsils and pharynx was not satisfactory. The temperature was 105° F. on admission.

Behring's Antitoxine No. 2 was injected into the muscles of the right thigh. The child was practically moribund on admission and died suddenly eight hours later.

Bacteriological Examination.—Cover-slips showed the diphtheria bacillus and cocci in groups or chains. From the cultures the diphtheria bacillus and the streptococcus were isolated.

An autopsy was not permitted.

Case 8.—Female, aged 29 months, white. Admitted to the hospital with dyspnoea August 12, 1895.

History.—Family history negative. The patient had measles five weeks ago. She has had a discharge from the right ear for seventeen months.

The present illness began three days ago with cough. The child, however, ran about and played as usual up to last night. This morning about 4 A. M. she woke up with a severe attack of dyspnoea, which had gradually increased.

On admission the child was dull and apathetic. The mucous membranes and finger-tips were slightly cyanotic. There was marked obstruction to inspiration. Both tonsils were swollen and covered with a grayish exudate. There was no exudate on the posterior pharyngeal wall. Temperature 100.5° F.

Behring's Antitoxine No. 3 was injected into the subcutaneous tissue of the back.

The dyspnoea became rapidly worse about three hours after admission, and the patient died during an attempt at tracheotomy.

Bacteriological Examination.—Cover-slips from the membrane showed many typical diphtheria bacilli. Cultures showed the same organism. An autopsy was not permitted.

Case 9.—Male, aged 2 years and 10 months, white. Admitted September 8, 1895, complaining of sore throat.

History.—The family history was negative. The child has had no previous illness.

The present illness began five days before admission with anorexia. Two days later the child complained of pain on swallowing. This morning a membrane was discovered in his throat by his physician and he was brought to the hospital.

On admission the general condition was good. Both tonsils were swollen and covered with patches of grayish-yellow exudate extending on each side into the uvula. The pharynx is clean. The glands of the neck are not enlarged.

Behring's Antitoxine No. 2 was injected into the subcutaneous tissue of the back.

September 9. The membrane seems to have spread slightly. The child is bright.

September 10. The child is better; the membrane has ceased spreading.

September 11. The membrane has largely disappeared.

September 13. The throat is entirely clear.

The temperature on admission at 8 P. M. was 100.4° F. At 2 A. M., four hours after the inoculation, it reached 101.8° F.; it then fell gradually, reaching normal 24 hours later and never again passing 99.2° F. The pulse was always strong.

No skin eruption was noted.

Bacteriological Examination.—Cover-slips from the throat showed suggestive bacilli, but no typical ones. Streptococci were present in fair numbers. Cultures showed the diphtheria bacillus and the streptococcus.

A guinea-pig inoculated with a 24-hour bouillon culture of the bacillus died 48 hours later with the lesions of experimental diphtheria, the organism being recovered from the seat of inoculation.

Case 10.—Male, aged 2, white. Admitted to the hospital September 20, 1895, with difficulty in breathing.

History.—A satisfactory history cannot be obtained, as the mother speaks only Bohemian.

From the mother's account the child has only been ill twenty-four hours, its only symptoms being irritability and loss of appetite.

On admission the child looked ill. The breathing was rapid and slightly obstructed. The voice was, however, clear. Over the tonsils and the neighboring parts of the soft palate a thick white membrane was seen.

Behring's Antitoxine No. 2 was injected into the buttock.

The breathing was somewhat more obstructed in the evening and the voice a trifle brassy.

September 22. The membrane has entirely disappeared. The child looks perfectly well.

The temperature remained steadily up about 102° F. until the 23d, when it fell gradually, reaching 99.4° F. at 10 P. M. and not rising again.

Bacteriological Examination.—Cover-slips from the membrane showed a fair number of diphtheria bacilli. The cultures showed an almost pure culture of bacillus diphtheriae.

Case 11.—Male, aged 7, white. Admitted to the hospital November 4, 1895, complaining of sore throat.

History.—The family history is unimportant except that he lost one sister from croup. He has had measles but no other illness. The present illness began four days ago with pain in the throat, which was increased by swallowing. The pain was at its worst two days ago, and he felt weak at that time. The pain and the weakness are the only symptoms complained of.

On admission the general condition was good. Both tonsils were swollen and showed numerous areas of membrane formation with rather a patchy arrangement. There was also a patch of membrane on the soft palate to the right of the uvula. The breathing was somewhat harsh, but there was no great dyspnoea.

Behring's Antitoxine No. 2 was injected into the muscles of the left thigh.

November 6. The patient is quite comfortable; he has no pain on swallowing.

November 7. Only a small patch of membrane remains.

November 8. The membrane has quite gone.

The temperature on admission was 100° F., and sank following the inoculation to 98.8° F. It was up to 100° F. at noon on the 6th, and then fell gradually, never again reaching above 99.5° F.

Bacteriological Examination.—Cover-slips showed a good many typical diphtheria bacilli. Cultures showed the same organism, almost a pure growth.

The cases recorded in this group are of that class which from a clinical standpoint alone would be regarded as diphtheria, *i. e.* they are characterized by definite membrane formation. Aside from the question of the influence of the antitoxine on the progress of the disease they present no special points of interest, with the exception of Case 2.

This case is of interest from several points of view :

1. As showing the duration of antitoxine immunization and of natural immunization.

2. As showing the possibility of auto-infection.

3. As demonstrating that the diphtheria bacillus can exist for long periods in the throat.

4. As demonstrating the resistance of the diphtheria bacillus to chemical agents.

That the immunity conferred by the antitoxine (passive immunity) does not protect over as long a period as natural immunity (active immunity) has long been known as far as animals are concerned. Cases showing the duration of this artificial immunity in man are not, however, common. Henach has reported a case in which a recurrence of the disease occurred from 25 to 30 days after the use of the antitoxine, and Wolff-Lewin reports a case where a child who had apparently recovered perfectly after the use of antitoxine developed symptoms of a fresh attack ten days from the beginning of the first one. In our case the patient was immunized on January 7th and contracted a second attack of what was presumably diphtheria about three weeks later; it is true that the patient was not under observation during this second attack, but cultures made only a week later showed the diphtheria bacillus to be present in the throat. During this second attack no antitoxine was used, and yet a third attack occurred thirty-seven days after the beginning of the second. In this case, then, the period over which active immunity lasted would seem to be about thirty-seven days, whilst that over which passive (antitoxine) immunity lasted was only twenty-one days.

It seems highly probable that auto-infection occurs in most cases of croupous pneumonia and in many of streptococcus throat; it is also known that virulent diphtheria bacilli are occasionally found in the throats of healthy people. This case would seem to prove definitely that auto-infection does occur in diphtheria, as it was shown that the diphtheria bacilli were constantly present in the throat between the second and third attacks, the throat all this time presenting a perfectly normal appearance. It is only fair to conclude that when the immunity was worn out the individual became infected by the bacilli then present.

Although the patient was not under constant observation from January 7th, when the first attack began, until April 10th, when the diphtheria bacilli finally disappeared from the throat, yet cultures were made frequently enough to warrant the assumption that the bacilli were continuously present over the period between the dates specified. In an observation recorded in the British Medical Journal of which Sevestre speaks, the bacilli were obtained from the throat seven months after the disappearance of the membrane; but in this case the cultures were few and far between. The question of the survival of the diphtheria bacilli after the disappearance of the membrane is an important one from a prophylactic point of view, for we must admit the possibility if not the probability of individuals such as our patient transmitting the disease to others. Such a possibility once being established, the isolation of diphtheria cases would not be subject to any fixed law, but would depend on the demonstration of the presence or absence of the bacillus in the throat.

The fact that the bacilli in this case were only in part destroyed by the repeated action of Löffler's toluol solution is

an interesting one, especially as the solution was acting on a throat devoid of membrane. The fact that the bacillus appears so resistant should not, however, deter us from the use of such chemical agents, as clinical experience has amply proved their value.

DIPHTHERIA SIMULATING FOLLICULAR TONSILLITIS.

Case 12.—Female, aged 23, white. Admitted to the hospital January 17, 1895, complaining of sore throat.

History. The family history was unimportant. The patient had the usual exanthems as a child; she has not had occasion to sore throat. The present illness began four days ago with backache, headache, sore throat and pains in the limbs. There was slight pain on swallowing.

On admission the general condition was good. Both the tonsils were swollen and on both sides covered with numerous yellowish patches, apparently plugging the follicles. No definite areas of membrane were to be made out.

Behring's Antitoxine No. 2 was injected into the subcutaneous tissue of the back.

January 18. This morning a small patch of membrane about the size of a split pea was noticed on the soft palate; it was quite adherent.

January 19. The membrane is disappearing.

January 21. The membrane has entirely gone.

The temperature on admission was 100.2° F., and about the same at the time the inoculation was made; the following morning it was 99° F., and never passed above this point subsequently. The pulse was always strong. There was some during about the seat of inoculation three days after its performance, but no skin eruption was noticed.

Bacteriological Examination.—Cover-slips from the throat showed suspicious bacilli, but nothing definite. Cultures showed the diphtheria bacillus in practically pure culture.

A guinea-pig inoculated with a 24-hour bouillon culture showed marked local reaction, but did not die.

This case corresponds to those described by Koplik as acute lacunar diphtheria of the tonsils. It illustrates the necessity, not yet fully appreciated, of a bacteriological diagnosis in all cases of throat inflammation. It is just such cases as this which would be clinically regarded as a non-infectious tonsillitis, which may give rise to serious epidemics of diphtheria.

DIPHTHERIA WITHOUT MEMBRANE.

Case 13.—Female, aged 35, white. The patient has been in the hospital for fifteen months with progressive muscular atrophy. On February 17, 1895, she complained of sore throat. The throat was examined and found to be a little swollen and reddened, but there were no signs of membrane. On the 18th the throat was again examined and showed the same appearances. Cultures were made at this time and showed the following day, many colonies of typical diphtheria bacilli.

The patient was transferred to the isolation ward January 19. Her throat then was a little swollen and reddened, but there were no signs of membrane. There was no discharge running at the nose. The general condition was excellent. The throat remained reddened and swollen over a period of several days, the swelling subsiding during this period and the redness decreasing.

The treatment consisted of a febrifuge spray, locally, and whiskey as a stimulant.

The temperature, which was 100.2° F. on the night of February 17, rose to 101.5° F. by noon of the next day, and remained so till 6 P. M., when it fell, from which time it never passed 99.5° F. subsequently.

Bacteriological Examination.—Cover-slips did not show distinct diphtheria bacilli. Cultures showed an almost pure growth of the bacillus diphtheriae.

A guinea-pig inoculated with a 24-hour bouillon culture showed a well-marked local reaction, but did not die.

This case again illustrates the necessity of a bacteriological diagnosis in all suspected throat cases; clinically, no feature was present in this case to indicate diphtheria.

MULTIPLE INFECTION WITH BACILLUS DIPHTHERIAE.

Case 14.—Male, aged 4, white. Admitted to the hospital March 29, 1895, on account of fever and a discharge from the right ear.

History. The family history is unimportant. The patient was in the hospital the June previous with malarial fever, but recovered completely. The present illness began three days ago with pain in the head. At this time the child was noticed to hold his hand constantly to the side of his head. The morning following the onset of the pain he seemed better, but it was noticed that there was a discharge from the right ear, which has continued since. His nose has been discharging for a month or two; he has never complained of sore throat.

March 31. On admission to the isolation ward the child looked rather pale and stupid. There was a thick, creamy, odorless discharge from the right ear which was very profuse. From both nostrils there was a thick muco-purulent discharge. There was no sign of membrane in the nose. The tonsils and pharynx were reddened, but showed no signs of membrane. The neck glands were enlarged, hard and tender to the touch. There was a small area of dullness at the base of the left lung over which the breathing was feeble. On the radial side of the right thumb there was an excoriated area at the root of the nail. This area was covered by a whitish-yellow membrane, which, on being stripped off, left a raw, non-bleeding surface.

Behring's Antitoxine No. 2 was injected into the subcutaneous tissue of the back.

April 2. The child seems about the same. The ear is still discharging profusely; the nose less so than formerly. A slight membrane has reformed over the wound in the right thumb. The throat is perfectly clear. In the afternoon the child did not look quite so well.

April 3. The child looks better this morning. About midday the left ear was noticed to be discharging; the patient had not complained of any pain in the ear region. There is still a slight membrane over the right thumb.

April 4. The left thumb is excoriated at its base; there is no membrane over the excoriation.

The child was taken home against advice this afternoon.

The temperature on admission to the hospital was 104° F. It sank in the evening to 101° F., and from March 30 to the time of admission to the isolating ward varied between normal and 101° F. At the time of the injection of the antitoxine the temperature was 100.8° F.; it sank gradually over the next forty-eight hours, the highest point reached after the inoculation being 101° F. at 8 P. M. on the day following. The pulse was always fairly strong.

No reaction about the seat of inoculation and no skin eruption was noted.

Bacteriological Examination.—Cover-slips from the discharge from the right ear showed the predominating organism to be a bacillus morphologically resembling the diphtheria bacillus; a good many cocci in chains were also present. Cultures showed many typical diphtheria bacilli and a fair number of streptococci.

A guinea-pig inoculated with a 24-hour bouillon culture showed very marked local reaction and was very ill for two or three days, but eventually recovered.

Cultures from the nasal cavity, the tonsils and the pharynx all showed the bacillus diphtheriae associated with the streptococcus pyogenes; in the tubes from the nasal cavity a few colonies of the staphylococcus aureus were also present.

Cultures from the right thumb showed the diphtheria bacillus with the streptococcus pyogenes and the staphylococcus aureus. Cultures from the left thumb showed the diphtheria bacillus and the streptococcus pyogenes.

The organisms were still present when the child was removed from the hospital.

The two main points of interest in this case are the double otitis media and the occurrence of wound diphtheria.

It is possible that many cases of otitis media in which the diphtheria bacillus is concerned are overlooked, the reported cases not being very numerous. Councilman has reported cases in this country, and Kossel and Kutscher in Germany. In Kossel's cases the diphtheria bacillus could not be isolated from the throat, though membrane was present, a fact which Kossel explains by the overgrowth of the diphtheria bacillus in this locality by other organisms. Most of these cases of otitis media have not been pure diphtheria infections, so that it is often impossible to say whether we are dealing with a primary mixed infection, or whether the diphtheria bacillus was the original causal factor and other organisms afterwards crept in.

Cases of wound diphtheria would also seem to be uncommon, that is if the term wound diphtheria be limited to the infection of wounds with the Klebs-Löffler bacillus.

Abel has reported a case in which the diphtheria bacillus alone was present in the membrane, proving conclusively that this organism is capable of membrane formation *per se*, a fact which had been disputed by many writers.

It is interesting to note in our case, that while the diphtheria bacillus was obtained from the wound on each thumb, membrane was only present over the wound of the right thumb.

ANGINA CAUSED BY THE PSEUDO-DIPHTHERIA BACILLUS.

Case 15.—Female, aged 22, white. The patient had been in the hospital for some weeks with chlorosis. On the evening of January 31, 1895, she complained of slight sore throat, and examination showed a reddened and swollen condition of the tonsils, with a small patch of membrane (?) on the left side. The next morning the membrane could not be seen and the patient felt perfectly well.

The temperature had risen sharply on the evening of the 31st to 100.5° F., but was normal by 8 A. M. the next morning, and no further elevation occurred.

Bacteriological Examination.—Cover-slips showed apparently characteristic diphtheria bacilli. The cultures were overlooked until the second morning after they were taken, when the medium was seen to be thickly studded with white colonies resembling diphtheria colonies. On cover-slips the organism much resembled the diphtheria bacillus; it was, however, shorter and thicker, and the individual organisms showed a strong tendency to lie in rows parallel to one another. Culturally, the organism also resembled the diphtheria bacillus, but was a much more profuse grower and alkalinized litmus milk.

A guinea-pig inoculated with a 24-hour bouillon culture showed neither local nor general reaction.

The organism could not be recovered from the throat eighteen days after the attack.

The organism isolated in this case corresponds in all its characteristics to that first described by Hofman and subsequently by Löffler and others. Koplik has described cases in which this organism was found, but not associated with membrane. The membrane in our case seems rather doubtful, as the examination at which the membrane was seen was made by candle light, and on the following morning no membrane was to be made out.

MEMBRANOUS ANGINA SIMULATING DIPHTHERIA BUT DUE TO ORGANISMS OTHER THAN THE KLEBS-LÖFFLER BACILLUS.

Case 16.—Male, aged 32, white. Admitted to the hospital January 24, 1895, complaining of sore throat.

History.—The family history was unimportant. The patient had the usual exanthems as a child and thinks he had diphtheria at three years of age.

The present illness began two days ago with severe headache and a violent shaking chill lasting about twenty minutes and followed by fever. The following day he felt better, but woke up on the morning of the third day with fever again. The throat has only been slightly sore.

On admission the general condition was good. Both tonsils were swollen and congested and covered with a thick gray-yellow membrane, which was quite densely attached. The uvula and soft palate were not invaded.

Behring's Antitoxine No. 3 was injected into the subcutaneous tissue of the back.

January 25. The patient feels much better. The membrane has partly disappeared.

January 26. The membrane has entirely disappeared.

The temperature on admission was 100° F.; it had risen to 102° F. two hours later, and then fell rapidly, reaching normal in twelve hours. The pulse was always strong.

Bacteriological Examination.—Cover-slips were negative for diphtheria bacilli.

In cultures the predominating organism was a short, slim bacillus which grew well on all media, producing a bright green pigment. The organism corresponded in all its culture reactions with the bacillus pyocyaneus.

Case 17.—Female, aged 41, white. The patient had been in the hospital for several months with acromegaly. She was admitted to the isolating ward January 25, 1895.

History.—The evening before admission the temperature rose and she complained of sore throat. The following morning, when the patient was seen, she was quite short of breath and sitting up in bed. Examination of the throat showed both tonsils to be much swollen and reddened. Over the left tonsil was a large grayish-yellow patch the size of a quarter, which had the appearance of false membrane. By 7.30 in the evening several spots of exudate were seen on both tonsils and the case presented more the appearance seen in follicular tonsillitis.

Behring's Antitoxine No. 3 was injected into the subcutaneous tissue of the back.

January 26. The throat looks a little better. The patches still remain, but the swelling has subsided somewhat.

January 27. The patches are fewer in number.

January 28. The exudate has almost gone. The patient complains of a little pain and stiffness in the neck and back.

The temperature on admission was 102° F. By the following morning it had fallen to 100° F., but rose again in the evening to 102° F. A similar exacerbation occurred the following day, after which the temperature gradually fell to normal. The pulse was strong all through the course of the illness.

No skin eruption was noted.

Bacteriological Examination.—Cover-slips showed no diphtheria bacilli; a variety of organisms were present, no one apparently predominating.

Cultures showed an almost pure culture of the streptococcus pyogenes.

Case 18.—Male, aged 31, white. Admitted to the hospital March 11, 1895, complaining of sore throat.

History.—The family history was unimportant. The patient had the usual exanthems as a child; he has not been subject to sore throats.

The present illness began three days ago with soreness of one, and later, of both sides of the throat. He had headache and general aching all over. No chill or chilly sensations.

On admission the general condition was good. The throat was congested, and the tonsils were much swollen, almost meeting in the middle line. On the inner side of each tonsil there was a sloughy-looking yellow-gray membrane. The neck glands were enlarged and tender.

Behring's Antitoxine No. 2 was injected into the subcutaneous tissue of the back.

In the evening of the day of admission the throat was so swollen that the patient had difficulty in swallowing even liquids.

March 12. The swelling is decreasing; the patient feels better.

March 14. The swelling is much less.

March 19. The membrane has entirely disappeared.

The temperature on admission was 103° F. ... next morning it was down to 101° F., but by 8 P. M. was up to 104° F.; it fell in the night, but rose the next afternoon to 102.5° F., after which it gradually sank to normal.

No skin eruption was noted.

Bacteriological Examination.—Cover-slips from the membrane showed numerous cocci in chains, but no diphtheria bacilli.

Cultures gave a practically pure growth of streptococcus pyogenes.

These cases again show the necessity of bacteriological examination in all inflammatory throat affections.

Case 16 is interesting from a bacteriological point of view, for, so far as we have been able to make out, a membranous angina due to the bacillus pyocyaneus has not been described hitherto. This organism, though usually comparatively harmless, has been described as a factor in various diseased conditions, usually in association with other organs; in our case it was apparently in pure culture, but this may be due to the fact that it had overgrown the organisms with which it was associated. The comparatively frequent presence of the pyocyaneus in chronic otitis media would lead one to suspect that it may not be an infrequent inhabitant of the nasal or buccal cavities.

The Effect of the Antitoxin Treatment.

Of the eighteen cases above recorded, sixteen received the antitoxine treatment, three of these cases being non-diphtheritic.

While this of course is too small a number of cases on which to base any statistical conclusions, several facts in connection with the treatment seem worthy of attention.

Two of the cases died, but both of these were moribund on admission, one dying three and the other eight hours after admission, so that the antitoxine was given no chance.

The other thirteen diphtheria cases were most of them mild, in fact none were very severe, but both on the general condition and on the temperature the antitoxine seemed to have a marked effect. It was almost invariably noticed that the day following the injection the patient was much brighter, and in the case of children the return of the appetite was the most marked indication of improvement.

In looking over the cases it will be noted that in those due to the bacillus diphtheriae the antitoxine, as a rule, caused a reduction of the temperature to the normal inside of twenty-four hours; in one or two of the cases there was a slight rise in the temperature eighteen to twenty hours after the inoculation, but in only one case was no effect on the temperature noted. The last two cases afford excellent examples of the effect of the antitoxine on mild diphtheria cases, both due to mixed so that a spontaneous fall of temperature can be excluded, and in both the temperature was not influenced in the slightest degree by the antitoxine.

Skin eruptions following the antitoxine injections were noted in several of our cases; they have been noted by various observers since the inauguration of the treatment, but not enough stress has been laid on the fact that these eruptions are in all probability due to the serum or the antitoxic agents contained therein. The deleterious effects of the serum of one species of animal when injected into a

number of another species are too well known to be repeated here, but it is interesting to know that Sevestre, by injecting horse-serum in twenty-centimetre doses into children with non-diphtheritic sore throats, was able to produce urticaria and other forms of skin eruption similar to those observed after the use of the antitoxine.

The skin eruptions were the only bad effects, if one could so call them, which were observed after the use of the antitoxine. No other appreciable symptoms plainly due to the injection could be observed, nor did the examination of the urine give evidence of any such.

PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS HOSPITAL MEDICAL SOCIETY.

Meeting of October 7, 1895.

Pyarthrosis—Discussion on Dr. Finney's paper. (See September-October Bulletin, page 144.)

DR. HALSTED.—In these cases of knee-joint irrigation we do not hope to do more than to greatly inhibit the activity of the micro-organisms—to assist the tissues to destroy the micro-organisms. It is rarely necessary to do more than incise an acute abscess; the tissues do the rest. And yet we know that the tissues about the abscess have been invaded by the pyogenic micro-organisms. In irrigation of the knee-joint we do not expect to reach the micro-organisms outside of the joint.

In the last case reported by Dr. Finney—the one with triple infection—I do not feel at all sure that we could not have taken care of the joint itself. We amputated because in a few days we found the tissues in the thigh almost up to the hip-joint invaded by the organisms to a shocking extent, with lesions characteristic of the air-producing bacillus.

That solutions of bichloride of mercury are more efficacious than salt solutions in destroying and inhibiting pyogenic organisms outside of the body we have sufficient proof. There is also abundant clinical, if not wholly conclusive experimental evidence that the same is true in the tissue spaces, in joints, etc.

The irrigation of the urethra in the treatment of gonorrhœa furnishes a good clinical example of the benefits to be derived from solutions of corros. sub. Here, too, the specific micro-organisms have been demonstrated in the tissues outside of the urethra.

I speak from a great deal of experience, from daily observations for five years in the Roosevelt Hospital Dispensary, New York. In this work I was very ably assisted by Drs. Richard Hall and Frank Hartley of New York. The salt solutions are worse than ineffectual in the treatment of gonorrhœa. With them we never succeeded in aborting a case of gonorrhœa, either in private or dispensary practice, but we constantly induced a cystitis and epididymitis. With the bichloride irrigation, not a single case of cystitis or epididymitis occurred in these five years. I think that we have had the same experience in the dispensary here. Doctor Brown told me less than a year ago that he had never produced cystitis or epididymitis with bichloride irrigation. In private practice it is very common, indeed it is the rule, to abort a gonorrhœa within a week or ten days with bichloride irrigation. Previous to the use of this irrigation I used to dread to have a case of gonorrhœa come to my office; after its introduction I was glad to see them. The treatment became so popular that certain specialists in New York said that they would never use it because it was ruining their practice. Men after a few visits were cured. Nor would they return when a fresh urethritis was contracted. Furthermore, they taught their friends how to treat themselves. It would be too much of a digression to give the details of this treatment at this time. But I must ask your permission to say that everything depends upon the intelligent use of the method. The strength of the solution is determined by the use of the microscope and by the tolerance of the particular urethra. The strength to be used varies from 1–200,000 to 1–25,000. A tolerance of the stronger solutions has, usually, to be acquired. Men with red hair have, as a rule, sensitive urethræ.

The gonococci disappear promptly from the urethral discharge after irrigation with solutions of corrosive sublimate, but are uninfluenced, apparently, by irrigation with the salt solution.

A Case of Congenital Ptosis.—DR. THOMAS.

The patient, B. L., dispensary No. B 587, whom I wish to show to you to-night, is a boy fourteen years old. He applied at the dispensary a few days ago complaining that he was unable to open his left eye. No similar case had ever occurred in the family so far as was known. The patient was the eighth child and the only son. His birth was natural but difficult. It was noticed soon after birth that he did not open his left eye, and this condition has remained unchanged ever since. In other respects the boy has developed normally.

In looking at him you notice that while his right eye is widely opened, his left eye is nearly closed by the drooping upper lid. The skin of the forehead on the left side is drawn into deep furrows, as if he were trying to lift the eyelid by a strong action of the occipito-frontalis muscle. If the left eye be covered by the hand the forehead becomes smooth. When asked to look up, the patient opens his right eye wider, rolls the eyeball upward and contracts the occipito-frontalis on that side. On the left side the eyeball remains stationary, and the only noticeable change is a still greater contraction of the occipito-frontalis muscle; if, however, the left eye be passively opened, the eyeball is moved upward to some extent, but not so far as on the right side. In looking down, the eyes move normally, but the left upper lid does not follow the movement as does the right.

The lateral movements of the eyes are normal in extent, but there is a curious disassociation; they appear to move independently of each other. His pupils are equal, moderately

contracted; they react to light and during accommodation. Ophthalmoscopic examination shows the fundus to be normal. The facial muscles and those of mastication act normally.

In this case we have a congenital defect, consisting of a paralysis of the left levator palpebræ superioris, paresis of the superior rectus, and an associated over-action of the occipito frontalis on the same side, forming the common picture of congenital ptosis. The disassociation of the ocular movements is also of interest.

Congenital ptosis is, in our experience, not a common affection, this being the first case which I have had an opportunity of studying. The cause of the trouble is believed to be some abnormality in the nucleus of the third nerve, from which the muscles involved receive their motor nerve fibres. As far as I know, but a single careful anatomical examination of such a case has been made. I refer to the case of Prof. Siemerling, reported in the *Archiv f. Psych. u. Nervenkrank.*, Vol. XXIII, p. 764, 1892. The patient died from general paralysis, but during life he showed no ocular symptoms referable to that disease except the Argyle-Robertson pupils. The congenital ptosis was of the left eye. Siemerling discovered a lesion in the dorsal and ventral parts of the principal group of cells in the nucleus of the third nerve, and what seemed remarkable, the lesion was bilateral, although the left upper lid was alone affected. The nucleus of the third nerve is a complicated structure. It is, however, impossible to go into this question to-night, as I want to call your attention to some other interesting points in connection with congenital ptosis.

In 1883 Mr. Marcus Gunn exhibited a case before the Ophthalmological Society of London, which showed remarkable associated movements of the paralysed eyelid. When the patient opened his mouth or moved his jaw towards the right, the paralysed left upper lid was raised. This case created a great deal of attention, and a committee including Dr. Gowers, Dr. Stephen McKenzie and others was appointed to examine the patient. They confirmed Mr. Gunn's observation and expressed the opinion that in that case the levator palpebræ "is innervated both from the nucleus of the third nerve and from the external pterygoid portion of the nucleus of the fifth nerve."

Since the publication of this case, a number of cases have been reported, and in May, 1894, Bernhardt (*Neurol. Centralblt.*, Vol. XIII, p. 325) was able to collect twenty-four cases, eighteen of which he used for comparison. In nearly all of these the associated movement of the paralyzed lid occurred, either when the mouth was opened or the jaw moved away from the side on which the ptosis was present, *i. e.* during the action of muscles supplied by the fifth nerve. In two remarkable cases the fallen lid was raised when the other eye was voluntarily closed, an associated movement between a muscle supplied by the facial nerve on one side and one supplied by the third nerve of the opposite side.

The extent of the associated movement apparently varies in the different cases. The most striking report that I have seen was published in the *Archives of Ophthalmology*, Vol. XXII, p. 65, 1893, by Dr. A. A. Hubbell, in which there are three excellent photographs, illustrating this associated movement. In this case the paralyzed upper lid was raised quite as much if not more than the normal one when the mouth was opened.

As you see, when the patient whom I have here to-night opens his mouth wide, or moves the lower jaw strongly towards the right, there is no very evident raising of the left upper lid. If, however, careful measurements are made, it is found that the visual aperture widens two or three mm. The widening is greater when the patient looks down during the movement of the jaws. Voluntary closure of the right eye produces no effect on the left. It is not at all certain that this slight widening of the aperture is due to a contracture of the levator palpebrae and not to other mechanical causes.

The explanation of these associated movements is not clear. Most observers agree with the English committee in the belief that it is due to the third nerve's receiving axis cylinder processes from cells situated in the fifth nucleus. We know that fibres running in motor nerves may arise from cells quite widely separated in the central nervous system. You will see from the diagrams of the nuclei of the motor cranial nerves, which I have placed on the blackboard, the relative positions of the third and fifth nuclei. The third nucleus is under the aqueduct of Sylvius; the principal motor nucleus of the fifth is about the middle of the upper half of the fourth ventricle. The descending root of the fifth extends quite to the level of the third nucleus. There is some doubt as to whether this root should be considered sensory or motor. It is not difficult to believe that nerve cells might send their axis cylinder processes from either the motor nucleus, or from the nucleus from which the descending root arises, to leave the brain by the third nerve. If such a condition underlies the associated movements which occur in congenital ptosis, the question suggests itself whether the condition is a normal one, or whether it only occurs in connection with the abnormality of the third nucleus upon which the ptosis depends. In two cases in which the ptosis was acquired as one of the symptoms of ophthalmoplegia externa due to nuclear disease, Dr. Hughlings Jackson was unable to demonstrate any associated movements of the paralysed lids, and in the case before you I have not been able to convince either you or myself that there is any actual contraction of the paralysed levator muscle. These cases, so far as they go, would seem to indicate that this connection is not always present. I know of no anatomical investigations that bear on the subject.

Dr. Jackson, in the article referred to above (*Lancet*, Jan. 6, 1894), suggests another interesting question in connection with cases of congenital ptosis, *i. e.* whether Müller's muscle is also paralysed. You may remember that the eyelid contains, besides the levator palpebræ, smooth muscular fibres, the so-called Müller's muscle, which help to elevate the lid. This muscle receives its nervous supply from the cervical sympathetic. These nerve fibres leave the spinal cord by the upper four or five dorsal roots. The nerve cells from which they arise have not been localized, but it is believed that they are situated somewhere near the third nucleus. Since we believe that congenital ptosis is due to some central lesion, it is important to know whether Müller's muscle is paralysed. Dr. Jackson suggests a method by which this may be determined. It was pointed out by him that

Vol. XXXVIII, p. 432, 1885) that if a solution of cocaine be dropped into the eye the pupil dilates and the visual aperture widens. He demonstrated by experiments that this was due to a stimulation of the endings of the sympathetic nerve, causing contraction of the dilator muscles of the iris and of Müller's muscle in the lid. Dr. Jackson urges the importance of applying this test in nervous diseases wherever the sympathetic may be involved, and points out the desirability of testing a case of congenital ptosis in this manner.

We dropped into both eyes of this patient three or four drops of a four per cent. solution of cocaine. At the end of half an hour both pupils were dilated and the visual apertures of both eyes had widened about two mm. It would appear from this that the cocaine acted equally on the two sides and gave no evidence of paralysis of Müller's muscle.

Note.—The patient has been examined on several occasions since he was shown to the Society. The observations differ but little from those recorded, but it may be of interest to give the last note of the examination under cocaine.

December 9, 1895. 10.50 a. m., visual aperture, R. eye opened normal, 12.5 mm.

L. eye opened normally, 5 mm. Eye wide open, 5 mm. Pupils equal, about 5 mm. in diameter. One minim of an 8-per cent. solution of cocaine was put into each eye.

11.40 a. m., visual aperture. R. eye opened normally, 11 mm. Wide open, 15 mm.

L. eye opened normally, 7.5 mm. Eye wide open, 8 mm., and with mouth open, 9 mm. Pupils equal, diameters about 9 mm.—H. M. T.

Dr. L. F. Barker. — The case which Dr. Thomas has shown is of more than ordinary interest. As to the connections of the nervus trigeminus and its motor and sensory nuclei with the nucleus nervi oculomotorii, there is little that can be said to have been definitely established. This much is certain, that fibres run from the gray matter connected with the sensory portion of the fifth nerve (*i. e.* the substantia gelatinosa near the spinal tract of the 5th and the so-called sensory nucleus of the 5th) into the fasciculus longitudinalis medialis, and the intimate relations of the latter bundle to the oculomotorius nuclei have been very definitely proven. Whether or not the motor nuclei of the trigeminus (nucleus princeps and nuclei minores [radicis descendentis]) are directly connected with the nuceus n. oculomotorii, does not as yet seem clear. A large amount of work has been done with regard to the various groups of ganglion cells of which the nucleus of the oculomotorius nerve is made up, but up to the present the cells which have to do with individual muscles have not been satisfactorily localized. Neurologists have recently been inspired with new hope as regards this point through the introduction of a new method of investigation. In June of last year Nissl of Frankfurt-am-Main, in an address in Baden-Baden (*Centralblt. für Nervenheilk. u. Psychiatrie,* 1894, Bd. XVII, pp. 337–344), described a procedure which, although of relatively narrow application, has the advantage of establishing exactly the location and relations of many of the nerve cells in the gray masses. For example,

he states that the method will determine for each individual eye-muscle the localization of its corresponding nerve cells in the central nuclei, a result to which the most careful investigators with the use of other methods (*e. g.* v. Gudden's or Marchi's) have hitherto been unable to attain.

In an adult or half-grown animal a solution of continuity of the fibre connecting a nerve cell with a peripheral part, be it muscle fibre or epithelial surface, leads to retrogressive changes in the body of the nerve cell. These alterations, though somewhat different in nerve cells of different types, are very characteristic and easily recognizable, Nissl claims, after some experience. Very soon, too, changes occur in the neuroglia cells which are in the neighborhood of the affected neurons. The changes in the cells are recognizable in alcohol tissues sectioned and stained according to the latest directions of Nissl, and his staining reaction has to be looked upon as one of the most delicate we possess for the study of degenerations of the body of the nerve cell. In order to apply the method to the eye muscles, one would either extirpate a given muscle or cut the nerve supplying it, and subsequently (the lesions in the rabbit are most characteristic between the 8th and the 15th day) kill the animal and study serial sections of the nucleus of the third nerve. As Nissl points out, the very delicacy of the reaction necessitates the greatest caution in its application. Operations must be done aseptically, one must be absolute master of the technique and must be familiar with the appearances of the various cell-forms in the normal condition, otherwise the investigator will be led into serious error. Nissl suggests that his method be called " Die Methode der primären Reizung." Should this method prove to be as useful as it promises, and already confirmatory work has been done by other investigators, we can hope for a speedy settlement of the much vexed questions regarding the cells of the eye-muscle nuclei. Now that the importance of the gray matter in the anterior corpora quadrigemina as a governing centre for the various movements of the eye muscles is generally recognized, and the connections of the axons of the cells situated there by means of collaterals with the various eye-muscle nuclei have been definitely established, the possibility of an exact localization of the cells in the nuclei concerned directly with the individual muscles comes opportunely.

Another point in connection with the case Dr. Thomas has just reported seems to me worthy of remark.

In the formation of an associated movement there has been a marked dissociation of muscular contractions ordinarily associated. Dr. Thomas has spoken of the dissociation of movements of the muscles of the two eyes. Usually in contracting the frontalis muscle the fibres on both sides of the forehead are contracted at once. This boy possesses in an extraordinary degree the power of unilateral contraction of the frontalis; indeed, when his eyes are open the left frontalis is continually forcibly contracted, while the muscle on the right side is at rest. This is by no means surprising, for we know of many so-called associated movements which, through training and education, can be dissociated, as for example the isolation of finger movements observable in an accomplished pianist.

NOTES ON NEW BOOKS.

I. Vital Statistics of the District of Columbia and Baltimore, covering a period of six years ending May 31, 1890. By John S. Billings, M. D., Expert Special Agent. (*Washington, D. C.: Government Printing Office*, 1893.)

II. Vital Statistics of New York City and Brooklyn, covering a period of six years ending May 31, 1890. By John S. Billings, M. D., Surgeon U. S. A., Expert Special Agent. (*Washington, D. C.: Government Printing Office*, 1894.)

III. Vital Statistics of Boston and Philadelphia, covering a period of six years ending May 31, 1890. By John S. Billings, M. D., Surgeon U. S. A., Expert Special Agent. (*Washington, D. C.: Government Printing Office*, 1895.)

One hardly knows which to commend most, the patience with which the difficult and complicated results have been obtained by comparing and arranging the statistics in the above special volumes of the Eleventh Census, or the masterly manner in which the facts thus obtained have been arranged to elucidate many of the difficult problems of vital statistics. In these three volumes the comparative vital statistics of six important cities lying along the Atlantic coast have been presented ; New York being compared with Brooklyn ; Boston with Philadelphia, and Washington with Baltimore. The appropriateness of the comparison of New York with Brooklyn and Baltimore with Washington is obvious, as these cities are subject to the same climatic conditions and environment. The association of Philadelphia and Boston does not seem as natural, although it is possible that the dissimilarity of these cities in climate, location and character of population may be useful in giving emphasis to certain facts which are brought out more clearly by these differences. We learn that differences in death-rates are due to a variety of causes, such as race, sex, age, occupation, influence of poverty, ignorance of the laws of health on the part of the poor, abundance and cheapness of food-supply, dampness, pollution of soil, water-supply, house drainage and sewerage. Baltimore is an unsewered city, while Washington possesses a good system of sewers, and the latter, although more densely populated, has a lower death-rate than the former. In both cities the excessive death-rate of the colored race is explained by a high death-rate among children under five years of age. In both cities the highest death-rate is in low-lying districts near the harbors where there is the highest level of sub-soil water. In both cities the birth-rate among the colored people had decreased, and the proportion of deaths had decreased during the six-year period. The influence of a high level of sub-soil water is strikingly shown in New York by means of a transparent map of the original island of Manhattan with its marshes and water-courses, which can be placed over the colored maps showing deaths by sanitary districts during the six-year period under consideration, and which shows a greater mortality in the filled portions of the city. The same increased death-rate among dwellers upon filled ground is not shown in Boston, presumably because the back bay was filled with washed gravel, a much better material for underlying dwellings, and further because the made-land was occupied by the dwellings of the wealthy, who could live without crowding under excellent hygienic conditions.

The death-rate of New York is shown to be higher than that of any other city in the country, owing to the crowded condition of the island, the insanitary condition of the tenement houses, and the high infant mortality, especially among the children of foreigners. In this city the death-rate among children less than five years old is greatest among those children whose mothers had been born in Bohemia, and least among those whose mothers had been born in Poland and Russia, presumably of Jewish parentage, thus indicating the superior vitality of the Semitic stock. In Brooklyn, also, it was greatest among those whose mothers were born in Bohemia, but least among those whose mothers were born in Hungary, the latter evidently being a more resisting stock. In both Boston and Philadelphia deaths by consumption formed a very heavy percentage of the mortality. In

Boston consumption claimed more victims than any other one form of disease ; in Philadelphia but a single other disease, or rather combination of diseases, those of the nervous system, caused more deaths. There were more deaths from pneumonia in Boston than in Philadelphia, and the same was true of alcoholism. Typhoid fever, however, as might be supposed, when the water-supply of Philadelphia is considered, was a much more common cause of death in Philadelphia than in Boston.

It is interesting to notice that in all of these cities the determining influences which produce the greatest mortality from diarrhœal diseases are low-lying and tenement house districts, with an overcrowding of children. Diphtheria and croup are also especially fatal in low-lying water-side districts. It is true that these districts, in the absence of an epidemic of diphtheria and croup, may be free from any high mortality, but whenever an epidemic arises the death-rate is very high. It is impossible to do more than to glance briefly at a few of the many problems presented in these volumes. It is to be hoped that now their accomplished author has more leisure for work, by reason of his retirement from the U. S. Army Medical Corps, he may be induced to elaborate these into a monograph on the vital statistics of the great cities of the North Atlantic States. Whatever he may write will command wide attention from medical men and students of vital statistics, both in America and Europe.

A System of Surgery. Edited by Frederic S. Dennis, M. D., assisted by John S. Billings, M. D. Vol. II. (*Philadelphia : Lea Bros. & Co.*, 1895.)

The second volume of this work can be as highly recommended as the first ; we hope that the remaining volumes will be as good.

The book opens with a chapter on Minor Surgery and Bandaging, by Dr. Henry R. Wharton. The section on bandaging is excellently illustrated, mostly by means of photographic reproductions, and the directions for the application of bandages are clear and easily understood. The section on minor surgery is fairly complete, but a much more extensive account of the uses of massage in surgery would be in order, considering the important part it plays in the modern treatment of sprains and fractures.

Dr. Fowler's article on Plastic Surgery is well written. It deals with plastic surgery of the face and extremities only, however, no mention being made of the important plastic work in the genitourinary tract in cases of epispadias, hypospadias, etc.

Dr. Forwood's article on Military Surgery deals principally with questions of transportation and field technique ; it is clear and well written.

Dr. Senn's article on Diseases of the Bones is clear and concise ; the sections dealing with the pathological anatomy are especially well worth reading.

Dr. Gibney's article on Orthopædic Surgery is an excellent one. We hope that his method of treating sprained ankle will become more generalized, now that a description of it has appeared in book form.

Dr. Stimson's article on Aneurism is complete, and contains many excellent illustrations.

Dr. Dennis' article on Diseases of the Vessels is very short, but is well written and illustrated.

Dr. Gerrish's article on Diseases of the Lymphatics contains two good plates, showing the distribution of the more important lymphatics and their relation to the neighboring glands, which should be very useful. The reading matter, especially the articles on filariasis and elephantiasis, is carefully done.

Dr. Roswell Park contributes a masterly article on Diseases and Injuries of the Head. The sections on Fracture of the Skull are especially clear and very complete.

Dr. Keen's article on the Surgery of the Spine, and Dr. Mills on Diseases of the Nerves are well written, and are among the best in the book.

Taken as a whole, the articles in this volume are well and carefully written, and as a rule contain numerous references which should be useful to those intending to go more deeply into the various subjects.

A Manual of the Modern Theory and Technique of Surgical Asepsis. Illustrated. By CARL BECK, M. D. (*Philadelphia : W. B. Saunders*, 1895.)

This little book is a valuable guide to surgeons who wish to refresh their memories as to the latest antiseptic technique. It is clearly written, abundantly illustrated, and is very helpful. It covers much the same ground as the little work of Dr. Robb reviewed in the BULLETIN a few months ago.

BOOKS RECEIVED.

The Principles and Practice of Medicine. Designed for the Use of Practitioners and Students of Medicine. By Wm. Osler, M. D. Second edition. 1895. 8vo. 1143 pages. D. Appleton & Co., New York.

Personal Reminiscences and Recollections of Forty-six Years' Membership in the Medical Society of the District of Columbia, and Residence in this City, with Biographical Sketches of Many of the Deceased Members. By Samuel C. Busey, M. D., LL. D. 1895. 8vo. 373 pages. Washington, D. C., 1895.

The Care of the Baby ; A Manual for Mothers and Nurses, containing Practical Directions for the Management of Infancy and Childhood in Health and in Disease. By J. P. Crozer Griffith, M. D. 1895. 12mo. 392 pages. W. B. Saunders, Philadelphia.

NOTICE.

INDEX TO VOLUME VI OF THE JOHNS HOPKINS HOSPITAL BULLETIN.

ILLUSTRATIONS.

PUBLICATIONS OF THE JOHNS HOPKINS HOSPITAL.

THE JOHNS HOPKINS HOSPITAL REPORTS.

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Report in Medicine, II.

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IX. A Case of Raynaud's Disease. By H. M. THOMAS, M. D.
X. Acute Nephritis in Typhoid Fever. By WILLIAM OSLER, M. D.

Report in Gynecology, I.

XI. The Gynecological Operating Room and the Antiseptic and Aseptic Rules in Force. By HOWARD A. KELLY, M. D.
XII. The Laparotomies performed from October 16, 1889, to March 3, 1890. By HOWARD A. KELLY, M. D., and HUNTER ROBB, M. D.
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XIX. Report of the Urinary Examination of Ninety-one Gynecological Cases. By HOWARD A. KELLY, M. D., and ALBERT A. GHRISKEY, M. D.
XX. Ligature of the Trunks of the Uterine and Ovarian Arteries as a Means of Checking Hemorrhage from the Uterus, etc. By HOWARD A. KELLY, M. D.
XXI. Carcinoma of the Cervix Uteri in the Negress. By J. WHITRIDGE WILLIAMS, M. D.
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BULLETIN

OF

THE JOHNS HOPKINS HOSPITAL.

CONTENTS.

HYSTEROMYOMECTOMY AND HYSTERO-SALPINGO-ÖOPHORECTOMY BY CONTINUOUS INCISION FROM LEFT TO RIGHT OR FROM RIGHT TO LEFT.*

By Howard A. Kelly, M. D., *Professor of Gynecology in the Johns Hopkins University.*

The field for exsective operations is growing daily more limited, and my sympathy with this conservative movement in gynecology is so strong that I am unwilling even to speak of the more radical methods to be dealt with in this paper without emphasizing the necessity of limiting them to extreme cases. I will therefore briefly review the recent conservative advances made before describing the radical plan of operating.

Radical extirpative procedures will be avoided in a large number of myomatous uteri if the surgeon will carefully study out the relations of the body of the uterus and of the uterine cavity to the tumors; he will then often find that the tumors are so disposed that he may enucleate them by one or more incisions, and save the uterine body intact. This may even be done with interstitial tumors as big as a man's head, and where the fundus is raised in the abdomen as high as the umbilicus. I have in one case taken out seven tumors by as many separate incisions. Cases so treated may be looked upon from a practical surgical standpoint as closely analogous to the long uterine wound closed in a Caesarean section.

The radical method will again be avoided in a large number of the worst forms of inflammatory cases, those in which pus has formed, by my method of free incision in the vaginal fornix behind the cervix, followed by free drainage, without the removal of any organ. An abdominal incision may be required to guide the vaginal hand in breaking up all the pus pockets.

Hydrosalpinx and adherent tubes and ovaries may be treated by breaking up the adhesions, and by splitting open the dorsum of the tube, and dilating its lumen. In such bad inflammatory cases the operator should let the patient definitely understand that she takes some chances as to recovery under this plan of treatment, and may later have to submit after all to the radical operation.

The field left for the extirpation of uterus, tubes and ovaries, after making these important exceptions, is greatly limited. It includes hysteromyomectomy for uteri distorted by myomata, or enormous myomatous masses, where the question of conservation is as yet in abeyance. It also includes hystero-salpingo-öophorectomy for cancer affecting both ovaries, and ovarian cystomata affecting both sides, and old inflammatory cases in which tubes and ovaries are bound down in such dense adhesions that rejuvenation is impossible.

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* An address before Southern Surgical and Gynecological Association, Washington, D. C., November 12, 1895.

With these definitions I will now describe an operation which I practise at the Johns Hopkins Hospital, and which I have demonstrated in upwards of two hundred cases within the past two years. Visitors from the American Medical Association may remember some of my cases, operated on in the Hospital Amphitheatre, in May, 1895.

The great value of this operation is its rapidity, saving from 60 to 80 per cent. of the time consumed in the enucleation, and the method of dealing with certain serious complications.

The operation consists in the following steps:

1. Opening the abdomen.

2. Ligation of the ovarian vessels near the pelvic brim, either on the right or on the left side, clamping them towards the uterus, and cutting between.

3. Ligating the round ligament of the same side near the uterus, cutting it free, and connecting the two incisions, in order to open up the top of the broad ligament.

4. Incision through the vesico-uterine peritoneum from the severed round ligament across to its fellow, freeing the bladder, which is now pushed down with a sponge, so as to expose the supravaginal cervix.

5. Pulling the body of the uterus to the opposite side to expose the uterine artery low down on the side opened up. The vaginal portion of the cervix is located with thumb and forefinger, and the uterine artery, seen or felt, is tied just where it leaves the uterus. It is not always necessary to tie the veins.

6. The cervix is now cut completely across just above the vaginal vault, severing the body of the uterus from the cervical stump, which is left below to close the vault.

7. As the last fibres of the cervix are severed or pulled apart, while the body of the uterus is being drawn up and rolled out in the opposite direction, the other uterine artery comes into view and is caught with artery forceps about an inch above the cervical stump.

8. Rolling the uterine body still farther out, the right round ligament is clamped, and cut off, and lastly the ovarian vessels are clamped at the pelvic brim, and the removal of the whole mass, consisting of uterus, tubes and ovaries, is completed.

9. Ligatures are now applied in place of the forceps holding the uterine artery, round ligament, and ovarian vessels; if the surgeon prefers, these may be tied as they are exposed without using forceps.

10. After the enucleation the operation is now finished in the usual way, a) by closing the cervical tissue over the cervical canal, and then, b) by drawing the peritoneum of the anterior part of the pelvis (vesical peritoneum and anterior layers of broad ligaments) over the entire wound area, and attaching it to the posterior peritoneum by a continuous catgut suture.

The continuous transverse incision should always be started on the side where the ovarian vessels and the ovary and tube are most accessible. If the case is one of a fibroid uterus, and the tumors are developed under the pelvic peritoneum or in the broad ligament of one side, this side should be opened up last, from below upwards, when the tumors can be rolled up and out with surprising facility.

Displaced ureters will not be injured, for on the side on which the enucleation is started such a ureter is pushed down with the loose peritoneum as the uterus and tumors are pulled up and towards the opposite side; and on the other side, no matter how much the ureter is displaced out of the pelvis, as the tumors caught from below are rolled up and out, the ureter drops down with the peritoneum and cellular tissue to the pelvic floor, and the operator need not even see it be aware of its displacement, to avoid the risk of injuring it.

If the ureter is found to be displaced only on one side, the operation should begin on the opposite side.

To escape the danger of tying the ureter on the side on which the uterine artery is caught after dividing the cervix, I am careful to put the forceps on the artery well above the cervical stump and to tie there.

The abdominal incision is always closed without drainage, by using a continuous catgut suture for the peritoneum, interrupted silver wire sutures for the fascia, a buried continuous catgut suture for the subcutaneous fat, and the subcuticular catgut suture for the skin.

The important points accomplished by this method of operating are a) the great saving of time, and b) the simple way in which certain serious complications are met.

a) *Time saved.*—According to other methods of operating, half an hour or an hour, or even more, may be consumed in enucleating the tumors and in getting ready to close up the pelvic and abdominal wounds, while by this method the enucleation is often effected in three or four minutes, and in difficult cases in from ten to fifteen minutes.

The experience of every surgeon will bear me out in insisting upon the importance of saving time at this particular stage of the operation, that is, the stage of enucleation, which is most likely, when prolonged, to produce shock, and to be accompanied by excessive loss of blood.

Furthermore, when the enucleation of the disease is completed, all important questions affecting the vital interests of the patient have been answered; adhesions have been severed, important vessels controlled, intestinal complications dealt with, and tumors developed in situations difficult of access have been removed. In other words, those factors in the case which often demand an alert judgment and the highest surgical skill have all been dealt with; the rest of the operation, closing the pelvic wound and the abdominal incision, follows a certain routine which may with safety be left in the hands of a well trained assistant.

b) *Complications met.*—I have insisted particularly upon the novel way in which serious complications are simplified by this plan of treatment, and I would refer chiefly to two kinds of complications:

First, fibroid tumors located under the peritoneum of the pelvic floor, and

Second, inflammatory masses situated behind the broad ligaments, with dense adhesions to the pelvic peritoneum, to the rectum, and often to the small intestines.

In the case of the sub-pelvic peritoneal fibroids, it is astonishing how difficult they are to get at from above, and how easily on the other hand they roll out when handled from beneath by this procedure.
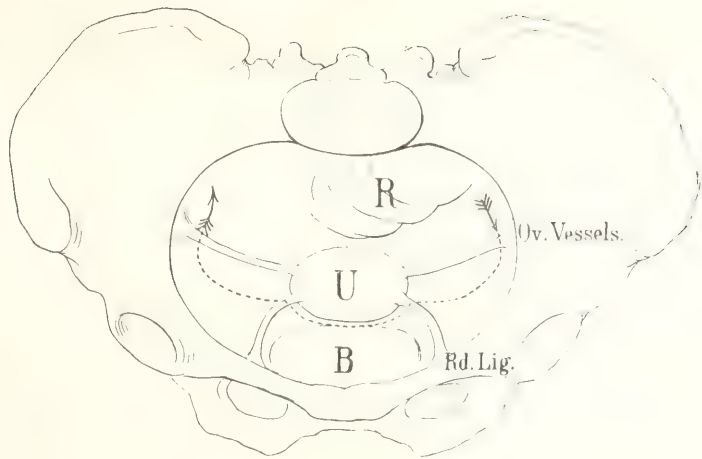
Showing line of incision through peritoneum from left to right, through left broad ligament, round ligament, utero-vesical peritoneum, right round ligament, and ending with right broad ligament near the pelvic brim.
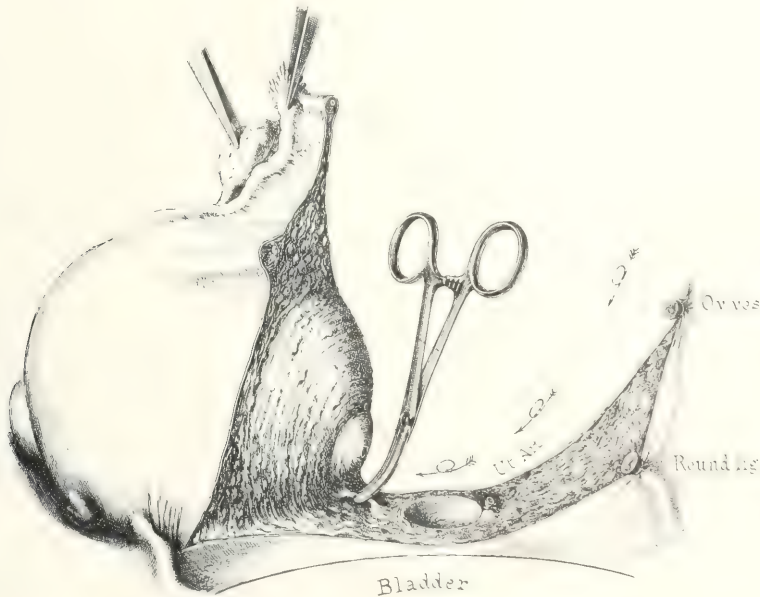
Fig. 2.

Left ovarian vessels tied, left round ligament tied, vesical peritoneum divided and pushed down and left uterine vessels ligated. Cervix amputated and uterus pulled up and out, exposing right uterine artery, which is clamped an inch above the cervical stump. The two following steps are clamping the right round ligament and right ovarian vessels, when the mass is removed.

HYSTERECTOMY SPUD. Used instead of a knife for amputating the uterus at the cervix. The curved blade enables the operator to work easily in a deep pelvis cupping out the stump.

I would say the same of the inflammatory cases. Matted masses adherent in all directions which resist enucleation from above are often removed with ease when rolled up from the pelvic floor from below. The adherent structures seem to be unrolled in a natural and easy way, in surprising contrast to the difficulties experienced, and the injuries inflicted, in gaining the slightest finger-hold in proceeding from above.

To recapitulate: Abdominal hysterectomy by the continuous incision down through one broad ligament across cervix and up through the other broad ligament, is contrasted with hysterectomy by an incision down to the cervix through one broad ligament, and then down through the other, followed by amputation of the cervix.

The special advantages offered by this method of operating are:

1. The saving of from 60 to 80 per cent. of the time in the enucleating stage of operation.

2. The ease with which intraligamentary myomata and myomata beneath the pelvic peritoneum may be enucleated.

3. The ease with which inflammatory masses posterior to the broad ligament may be enucleated by attacking them from below after dividing the cervix.

4. The control of a displaced ureter, on the side last opened up, keeping it out of the way of injury by the simple mechanism of the operation.

THE TREATMENT OF LARGE VESICO-VAGINAL FISTULÆ *

By Howard A. Kelly, M. D., *Professor of Gynecology in the Johns Hopkins University.*

In the sixth decade of this century the treatment of vesico-vaginal fistulæ was for the first time put upon a scientific basis by the labors of A. J. Jobert, G. Simon, and J. M. Sims.

While Jobert generally succeeded in closing the smaller fistulæ by simply denuding the borders and approximating the edges with sutures, he found that this plan did not succeed with those of larger calibre, where considerable tension was created by the approximation. In order to overcome this difficulty he devised a new plan of treatment (*autoplastie par glissement*), which consisted in deep incisions through the vaginal walls so placed as to relieve the tension on the united edges of the wound.

A deep transverse incision made in the vault of the vagina in front of the cervix, extending even up to the vesico-uterine fold of peritoneum, has been known ever since as the *incision of Jobert.†*

Simon, who followed Jobert, did away with his plan of incising the vaginal walls by using two sets of sutures (*Doppelnaht*). Those introduced at a distance from the margins of the wound were used to relieve tension (*sutures of detention*), and those introduced close to the wound were approximation sutures simply (*sutures of reunion*).‡ In addition to this, Simon devised specula to expose the fistula better, which have never been materially improved upon.

J. Marion Sims, working independently in the same line, devised his speculum for the exposure of the fistula with the patient in the left lateral position; he made a funnel-shaped denudation of its edges extending down to the vesical mucosa but not including it, and then united the wound with twisted silver wire sutures.§

Dr. T. A. Emmet (*The Principles and Practice of Gynecology,* Phila., 1879) and Dr. Nathan Bozeman ("The Gradual Preparatory Treatment of the Complications of Urinary and Fæcal Fistulæ in Women," *New York Med. Jour.,* Oct. 1, 1887) both laid stress upon the urgent necessity of the careful preparatory treatment of cases of large fistulæ by dividing cicatricial bands and using pressure to promote their absorption before undertaking the operation.

In spite of the many successes attained in the treatment of vesico-vaginal fistulæ by these methods, a certain percentage of cases still remained which could not be cured by any known plan of treatment, and it was even found necessary in some cases to resort to a complete closure of the vagina (colpocleisis).

The first active step taken with a view of reaching these inoperable cases was that of A. Martin of Berlin, who covered the defect with large flaps dissected up from the contiguous vaginal walls (*Zeitschrift f. Gyn. und Geb.,* Band XIX, p. 394).

L. von Dittel (*Abdom. Blasenscheidenfistel Operation,* Wien. Med. Woch. 1893, No. 25) opened up a new avenue when he attempted to close a fistula through an abdominal incision: he cut the bladder loose from the uterus and the vagina, freed the fistula from all its attachments, sewed it up and dropped it, and then united the vesico-uterine peritoneum to the uterus and closed the abdominal incision.

A. Mackenrodt of Berlin (*Centralblatt f. Gyn.,* No. 8, 1894) has given us the following admirable plan for the successful treatment of these large fistulæ (*ut sup.* p. 183); the fistula is exposed, the cervix and urethral prominence caught with tenaculum forceps, and the tissue made tense by traction in opposite directions. An incision is made through the vaginal walls in the median line across the fistula. Then with knife and forceps the margins of the fistula are split off so as completely to detach the bladder from the vaginal walls on all sides. The separation may be carried as far up as the vesico-uterine peritoneum. The mucosa surface is now closed by denuding its edges and drawing them together with fine silkworm-gut sutures. Beneath these a second and even

a third layer of sutures may be placed. After closing the bladder wound in this way, the vaginal wound is approximated as far as the tissues will permit, by denuding its margins, drawing the *corpus uteri* forwards, and passing sutures from side to side so as to bring the vaginal margins together and at the same time to hold the uterus lying upon them in anteflexion. If the margins will not come together they are sewed to the uterus on each side so as to form a firm base in the place of the fistulous orifice.

W. A. Freund *Eine neue Operation zur Schliessung gewisser Harnfisteln beim Weibe*, Samm. Klin. Vort. N. F. No. 118, 1895) has succeeded in closing two large fistulæ by utilizing the body of the inverted uterus brought through the posterior fornix into the vagina and sewed to the anterior vaginal wall.

E. C. Dudley of Chicago performed a remarkable operation in closing a large intractable fistula by making a semi-circular denudation on the inner surface of the bladder extending from one margin of the fistula around to the other. He then attached this denuded surface to the anterior part of the fistula and so obtained a closure. A portion of the posterior half of the bladder was thrown out of use, but the patient had good control over the newly formed organ.

In addition to these five plans, all aiming to reach the same difficult class of cases, I have one of my own to propose. It was carried out in the following manner: The patient, Mrs. Y., aged 40, 5-par., was operated upon, September 25, 1895. She had had a urinary fistula ever since her third labor, eight years ago, and five different attempts had been made by various surgeons to close it, all of them unsuccessful, and with the result of increasing the disability because of the sacrifice of important tissues at the base of the bladder, in fact the base of the bladder was entirely gone. I found the bladder everted through the fistula and filling the vagina with an angry red fungous-like mass; on replacing this, the anterior vaginal wall was seen to be absent, and in its place there was an enormous fistulous opening in the base of the bladder.

The fistula measured 4x3 cm., and involved the anterior lip of the cervix, which was destroyed, as well as the entire neck of the bladder anteriorly (vesico-utero-urethro-vaginal fistula); in front the sharp contour of the cut-off urethra presented a marked contrast to the normal funnel-shaped neck of the bladder. Posteriorly to the right and left of the cervix the ureteral orifices opened on the edges of the fistula. Two or more centimetres of each ureter had evidently been sacrificed in the operations. The vaginal walls forming the margins of the fistula were immovably fixed on all sides and contained numerous radiating bands of scar tissue. There was not the slightest chance of bringing such tissues together by any known method of denudation or suture, so I employed the following method, and covered the defect successfully. The steps of the operation were:

1. A crescentic incision separating the muscular and mucous coats of the bladder from the vagina, was made around the posterior two-thirds of the fistula, and the bladder detached from the supravaginal cervix all the way up to the peritoneum, and widely on both sides, by a blunt dissection. It was easy to avoid injuring the ureters splinted by the catheters.

2. I next denuded a strip around the remaining anterior third of the fistula on its vaginal surface, carrying the denudation down to the mucosa of the bladder and the urethra.

3. Two flexible ureteral catheters 2½ mm. in diameter were passed through the urethra across the fistula, and one conducted into each ureter and pushed up above the brim of the pelvis.

4. The part of the bladder freed from its attachments behind was now easily drawn forward and accurately applied to the immovable anterior third, to which it was united by interrupted fine silkworm-gut sutures. Each suture caught the under surface of the muscular coat of the bladder so as to turn the cut edge up towards the newly formed bladder. The ureteral orifices fixed on this edge were in this way turned into the bladder, and escaped transfixion or compression by the sutures through the presence of the catheters which made their position plain.

I left these ureteral catheters *in situ* three days, draining each kidney directly through its ureter and preventing any urine from entering the bladder to put a strain on the healing tissues. In the first forty-eight hours 900 cc. of urine escaped from the right ureter and 600 cc. from the left.

The wound healed perfectly except at the upper angle on the right, where a minute fistulous sinus 1 mm. in diameter remained, through which a little urine occasionally escaped.

When the patient left the ward she was able to hold 100 cc. of urine in the bladder and did not have to void it more than once in three hours. The raw surface on the anterior vaginal wall was replaced by a firm contracting cicatrix. It is important to note the amount of control secured in spite of the destruction of the neck of the bladder.

My operation differs from that of Mackenrodt in that I do not detach the bladder on all sides and sew it together in the middle of the fistula. It differs also in that I do not in any case include any of the uterus. My plan is easier to apply where the destruction of tissue is so great as to include the upper part of the urethra. It also provides for a detachment of the bladder only in the posterior and postero-lateral portions where such detachment is most easily effected, and then brings the posterior bladder wall into accurate apposition with the anterior vaginal wall.

My plan also differs radically from Dudley's, in that I make no denudation on the bladder mucosa, throwing out of use that part of the bladder lying below the line of denudation. On the contrary, I utilize all the bladder tissue left by the fistula in freeing the posterior part and drawing it over the defect.

DESCRIPTION OF THE JOHNS HOPKINS HOSPITAL.

BY JOHN S. BILLINGS, M. D., LL. D.

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Five essays relating to the construction, organization and management of Hospitals, contributed by their authors for the use of The Johns Hopkins Hospital. These essays were written by Drs. JOHN S. BILLINGS, of the U. S. Army, NORTON FOLSOM of Boston, JOSEPH JONES of New Orleans, CASPAR MORRIS of Philadelphia, and STEPHEN SMITH of New York. They were originally published in 1875. One volume, bound in cloth, price $5.00.

Fig. 1.

The fistula shown in sagittal section, the bladder
cut free from the uterus from *a* to *x*.
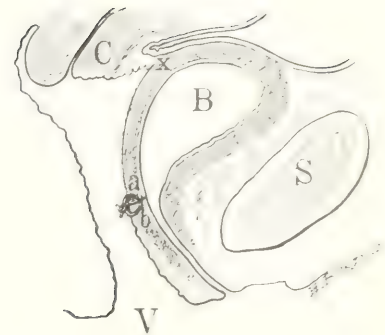
Fig. 2.

The fistula closed by drawing the bladder (*a*)
forwards to *x*.
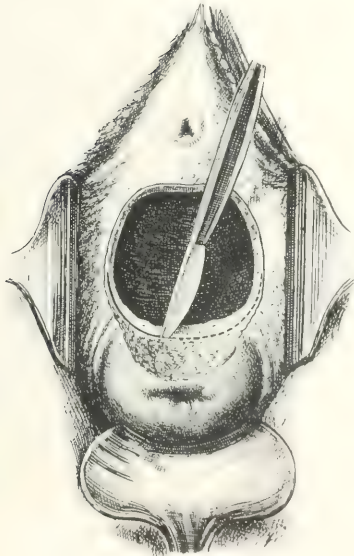
Fig. 3.

The fistula seen from below, the ureteral
orifices appear on the posterior margin. The
knife is in the act of separating the bladder
from the vagina in its posterior two-thirds.

Fig. 4.

The bladder loosened as shown in Fig. 3, drawn
forwards and sutured to the vagina with
interrupted sutures.

NEPHRO-URETERECTOMY—EXTIRPATION OF THE KIDNEY AND URETER SIMULTANEOUSLY.

BY H. A. KELLY, M. D., *Professor of Gynecology in the Johns Hopkins University.*

I had under my care in 1892 and 1893 a case of tubercular kidney and tubercular ureteritis, which came to me through the courtesy of Prof. M. D. Mann, of Buffalo. I operated upon the patient, March 30, 1893, removing the left kidney with its ureter as far down as the pelvic floor, for an advanced renal and ureteral tuberculosis. The operation was described, with photographs, before the Surgical Section of the American Medical Association, at Milwaukee, in May, 1893, but the manuscript was lost and the paper was not published.

CASE I.—The patient suffered from frequent spasms of the bladder of such intensity that she passed most of her time in a squatting posture in bed, screaming with pain, and from being a stout, hearty girl, she had become worn out and emaciated.

A vaginal examination showed the right ureter to be normal, while the left was large, thick, and rigid, apparently about 1 cm. in diameter, and so exquisitely sensitive that only the gentlest pressure could be made upon it. Its surface was also irregular and exhibited depressions at intervals. The enlarged ureter could also be located through the abdominal walls at the pelvic brim, and traced above this point by following a well-marked line of tenderness.

I catheterized the ureters and obtained a few cc. of a clear brown acid urine from the right side, free from abnormal elements, but nothing escaped from the left side after waiting some ten minutes; then upon manipulating the catheter a little, it was felt to pass through a resistant area in the posterior pelvis (ureteral stricture), and suddenly the urine began to flow so freely that in a few minutes about 90 cc. of pale lemon-colored alkaline urine escaped, loaded with pus and containing *tubercle bacilli.*

Upon cystoscopic examination the bladder showed some scattered seed-like elevations in front of the left ureteral orifice.

I determined to extirpate the left kidney with its ureter, and to this end made an incision in the left side 16 cm. long, outside of and parallel to the semilunar line. The muscles were divided, the peritoneum opened, and the viscera displaced to the right, and the posterior peritoneum cut through on the outer side of the colon, which was then further displaced to the right so as to expose the enlarged ureter lying on the psoas muscle. I then traced the ureter up to the kidney, which was cystic; the kidney was slowly enucleated from its bed; the surrounding fat contained a large amount of fibrous tissue and adhered densely to it, especially at the hilum, making the enucleation difficult. The renal vessels were finally tied with four fine silk ligatures and the kidney completely detached. The large hard ureter was next freed from its cellular bed from above downwards to the pelvic brim; about the middle of its course in the abdomen the ovarian vessels were tied.

The detachment of the ureter became more difficult after it was freed from the common iliac artery and vein; at a point 4 cm. below the pelvic brim where the ureter turns forwards, it was surrounded with such dense cellular tissue that I decided not to enucleate any farther, owing to the patient's weakened state; so I tied the ureter on the floor and cut it off, leaving wedge-shaped flaps, and removed the kidney with the entire abdominal portion and one-half the pelvic portion of the ureter.

The mucosa of the lower end beyond the ligature was sterilized with the thermo-cautery and the flaps approximated with six fine silk sutures and dropped.

The abdomen was irrigated with normal salt solution; then with the half hand in the abdomen as a guide, pushing out the thinnest dependent place in the left loin, an incision 3 cm. long was made by pushing a knife through, and a strip of gauze 14 cm. long was laid from the brim of the pelvis down into the loin and brought out. It was not necessary to unite the peritoneal wound beside the colon, because the natural apposition was so good.

The long abdominal incision was then closed with interrupted silkworm-gut sutures. The gauze drain in the loin acted as a vent for some bloody serum, and was removed on the fifth day. When the sutures were removed the union was perfect and there was no suppuration at any point.

The urine, which had persistently contained pus, cleared up at once, and the patient made an excellent recovery. On the eleventh of May I tried to remove the lower end of the ureter, left in the pelvis, by a vaginal incision, but found it impossible on account of the dense cicatricial tissue, which bled actively as soon as it was cut into.

Pathological Report.—The kidney was cystic and tubercular, and the ureter was converted into a large thick tubercular cord throughout.

The following report is from Dr. L. F. Barker, of the Johns Hopkins Hospital:

"The parts removed are the left kidney, with portion of the left ureter.

Weight of mass, 100 grams.

Surface of kidney is irregular, and there are several large protruding cysts, covered by the capsule.

The kidney measures 11x6x3.5 cm.

The largest of the cysts measures 4x5 cm.

The capsule of kidney is thickened, and in places intimately adherent to the surface of kidney substance.

On section, about 65 cc. fluid escaped from the cysts. The fluid in one of the cysts is white and flaky, and consists almost entirely of fatty debris. In another cyst the fluid resembles blood-stained urine. The cysts are found to communicate with the pelvis of kidney, and really correspond to the dilated calices.

The parenchyma of the kidney has been in a large part destroyed. In the central portion there is an area which has largely escaped, in which the cortex has a depth of 7 mm., but elsewhere the substance of the organ is represented by layers of different thicknesses (averaging 1 mm.), spread out over the dilated calices. Even in the less altered portion, the

frozen section shows that there are the same dilated tubules, the epithelium of which is somewhat flattened, besides occasional aggregations of rounded cells.

One or two glomeruli are seen to have undergone fibroid transformation."

Ureter. The ureter presents two points of constriction, respectively 3 and 8 cm. (1⅛ and 3⅛ in.) from the kidney. The hilum of the kidney was filled with dense adherent fat, preventing dissection of stricture without tearing it.

The ureter is much dilated, more at some points than at others, the calibre of its lumen varying from 1.7 to 3 cm. (⅔ to 1⅕ in.). Its wall is much thickened, measuring in places from 5 to 6 mm. The mucous membrane is of an opaque buff color, and at one spot, near the pelvis, there is a superficial area of calcification 5 mm. in diameter.

Frozen section of the ureter shows that the epithelium is entirely absent from the surface and that the mucous membrane is converted into a mass of diffuse tuberculous tissue, in which here and there definite tubercular nodules can be made out. The surface is not infrequently quite necrotic and the cells near it have undergone fatty degeneration. The muscular layer has been involved and there are many aggregations of small round and epithelioid cells there. In some places there is cell proliferation in the fibrous layer of the ureter. The connective tissue is from three to four times thicker than normal.

I have heard from the patient this year (Feb. 1896). She is stout and is in excellent health, and goes about everywhere, with but one of her old discomforts, frequency of micturition.

After the preceding operation, April 3, 1893, I secured a male cadaver for the purpose of determining the practicability of removing the entire ureter by an extra-peritoneal operation. I was able to do this easily through a long incision beginning in the loin back by the quadratus muscle and extended forwards and downwards, skirting the anterior superior spine and ending in the semilunar line. The kidney was freed and the peritoneum lifted up, and the entire ureter down to the bladder wall detached, without opening the peritoneum and without cutting a single large vessel. The accompanying drawing is from a photograph in my possession made at the time from the subject by Mr. A. S. Murray.

CASE II.—The next case to present itself in which the operation of nephro-ureterectomy seemed to be required was that of Miss P., age 23, a patient of Dr. B. W. Taylor of Columbia, S. C. She began as a child to complain of constant pain and weakness in the back which often compelled her to lie down; at nine years of age she was six weeks abed. She always suffered more or less from an inability to retain her urine, and this weakness became markedly worse after an attack of scarlet fever, when six years old. She received her first treatment when ten years of age, and has continued to need treatment year by year ever since that time. Micturition is frequent and not followed by relief. For four years past she has been obliged to go so frequently that she could pass but a few drops of pale urine at a time, accompanied by pain and strangury. For six years she has had an intermittent pain in the bladder, which within the past year changed to a constant dull ache. A year ago for the first time she had an attack of spasmodic pain in the region of the left kidney, very severe, accompanied by vomiting, and followed by pain in the bladder. Since the first attack she has had many others, often with not more than a week's interval. During such attacks she was compelled to walk about, and when confined to bed was obliged to lie with knees flexed upon the abdomen. Attacks were brought on by fatigue or exposure to cold, and lasted from one to three hours, each attack being followed by an increase in frequency of micturition, and in the amount of urine passed. Since the very first one she has had a constant pain and tenderness in the left groin above the crest of the ilium.

Repeated examinations of the urine showed that it was always acid, amber-colored, contained a marked amount of albumen, and deposited a heavy cloudy sediment. Pus cells were abundant, and hyaline and granular casts were found at almost every examination. Specific gravity varied from 1015 to 1020.

By palpation per vaginam the left ureter was found uniformly enlarged and extremely tender to pressure. It appeared to be transformed into a cord about three times the normal size. On the right side the ureter was normal and not sensitive. There was a distinct spot of tenderness at the pelvic brim about 3 cm. to the right of the promontory of the sacrum. The left kidney could not be palpated.

By cystoscopic examination the general surface of the bladder was found to be normal; the trigonum was injected, showing delicate leashes of vessels. The left ureteral orifice was deeply injected, surrounded by an area of granulations about 2 cm. in diameter, extremely sensitive to touch, and bleeding so readily that the ureteral orifice was at once obscured. It was impossible to introduce a catheter into the left side owing to the obstruction of the orifice by the granular masses. A ureteral catheter was introduced into the right (sound) side *and normal urine obtained.*

It was evident therefore from the examination showing the diseased state of the ureter, together with the history of the persistent pain localized on the left side, and the results of nine separate urinary examinations, that the disease was an infection of the left side, probably tubercular in character, although no positively recognizable tubercle bacilli were found in the urinary examinations.

In view of the manifest thickening of the ureter, shown by the vaginal examination, as well as the efflorescence of disease about the ureteral orifice in the bladder, I determined to extirpate the kidney with the entire length of the ureter, and, if the patient's condition would permit, to cut out an oval area in the bladder, resecting the localized disease there.

The operation was performed, December 18, 1895. Left nephro-ureterectomy for tuberculous kidney and ureter, by an extra-peritoneal abdominal incision.

Operation.—The left side of the mons was shaved, and the whole left side of the abdomen around to the backbone carefully cleansed and shaved. The patient lay on her right side with a pillow under the groin.

The incision commenced just in front of the vertical muscles of the back at the costal margin, and was carried

down towards the middle of the crest of the ilium and then in a gentle curve around the anterior superior spine 2 cm. away from it, and from this point in an oblique line down to the lower terminus of the left semilunar line, an inch above the symphysis pubis.

The posterior third of the incision was made first, and the renal vessels tied and the kidney and upper part of the ureter detached and brought out through it. The anterior two-thirds of the incision were then made in two successive cuts, after first closing the posterior part of the incision.

The first cut made was about 12 cm. long from the margin of the ribs by the quadratus muscle, down to a point just above the anterior superior spine, and extended into the peritoneum, through moderately fat abdominal walls and three thick layers of muscle, down to the subperitoneal fat. This was easily displaced and the peritoneum overlying the descending colon, which came into view, pushed inwards, while the fingers readily searched for and found the kidney in its normal position protected by the ribs. The surrounding fat was then slowly stripped off from the kidney on all sides, exciting a little bleeding from the capsule at one or two points where it adhered, and the kidney was gently drawn down and brought entirely out of the incision. The kidney mass consisted of two portions, a light-colored upper mass occupying about one-thirtieth of its length, but swollen and divided by shallow sulci into several smaller masses, and a deeply congested lower two-thirds which had some of the appearance of normal kidney substance. While holding the kidney, a small amount of fluid looking like blood and pus escaped through a minute opening in the lower part of the organ. The vessels were exposed by dissecting off the fat surrounding them with fingers and blunt instruments; they were unusually small in size, and of two arteries the larger was but 1½ mm. in diameter. The vessels were clamped at a distance from the kidney, which was then cut free, and the vessels, tied one by one with fine silk, were allowed to drop back. The enucleated kidney was enclosed in a gauze bag and held in a towel to prevent contamination of the wound by any of its discharges. The dissection was then continued on down toward the pelvic brim by lifting up the colon and sigmoid, and freeing the ureter with the fingers. This was done most easily by using the fingers to separate the cellular tissue and at the same time pulling the ureter with its attached kidney downwards. The upper part of the wound, with the exception of the upper angle which was left open 2½ cm. for a gauze drain, was now closed by bringing all the muscular and fibrous layers together by means of three silver wire mattrass sutures and two interrupted sutures.

I then continued the incision on down about 3 cm. above Poupart's ligament and almost parallel to it, to terminate it in the mons at the lower end of the left semilunar line. The muscular walls below were quite thin and were soon cut through. At the lower angle of the wound the round ligament was exposed about 3 cm. from its extreme lower end, and 1 cm. below this the deep epigastric vessels also crossed the incision between the peritoneum and the fascia. These vessels were tied doubly and divided. The round ligament was not divided but pushed aside. The thin peritoneum separating the wound area from the small intestines was now pushed

aside gently and the external iliac artery exposed skirting the brim of the pelvis with the great psoas muscle above it and the crural nerves and iliacus muscle beyond. Below the artery the external iliac vein was exposed lying flat against the pelvic wall. The ureter was easily dissected out of its bed until the base of the broad ligament was reached, by simply pulling it forward with the fingers without tying a single vessel. The broad ligament formed a distinct obstacle to further exposure of the ureter, because the tissues at its base together with the uterine artery and veins completely covered in the ureter with a firm sharp band. The uterus could not be felt on the median side. By lifting up the broad ligament with a finger between the ureter and pelvic wall, a ligature was passed by means of a needle and carrier to the inside of the finger, while another was passed one centimeter further inside of this, and the uterine vessels cut between them. In passing the first suture I experienced a little difficulty in catching the curved needle and bringing it up in the narrow space between the pelvic wall on one side and the displaced peritoneum on the other, and as I caught the needle to bring it up, the point pricked the external iliac vein, with the result of an immediate oozing of venous blood, lasting a few minutes and ceasing spontaneously; on account of this accident a second suture was passed from behind forwards, in the opposite direction. I was then able after dividing the base of the broad ligament to free the ureter up to its intra-vesical portion, which I recognized by the fact that any further efforts to strip it loose simply served to demonstrate its intimate connections with the bladder walls. At this juncture my assistant, Dr. Russell, put a finger into the vagina. When the end of his index finger rested at the vaginal vault, the tip of my finger in contact with the extreme end of the dissected portion of the ureter lay in contact with its second joint; in other words, I had dissected out the ureter 5 cm. below the vaginal vault.

During the latter part of the operation the patient was lying on her back with a long wound from the lower part of the ribs posteriorly extending down to the symphysis; the upper portion of the wound was closed in its deeper parts, the lower portion remained entirely opened, and the skin incision was not closed at any point. The kidney with its long ureter lay across the lower part of the abdomen to the right side, the ureter entering the wound at its lower angle. I now milked back any fluid in the ureter between two fingers, and clamped the ureter 2 cm. from the bladder, and tied it half-way between the clamp and the bladder with intermediate silk and then cut it off close to the clamp, after carefully surrounding the lower end with gauze to prevent any contamination of the wound in case a little pus should escape. The kidney with its ureter, 23 cm. long, were now taken away.

The lower end of the ureter distal to the ligature was next sterilized with a tube carbolic and applied and ...... and dropped to the pelvic floor ...... below the ...... surface.

No ligatures were applied on this ...... at a point between the renal vessels and the uterine vessels. The abdominal walls were closed by silver wire for the muscles and catgut for the fat and skin. A small drain was put in the lower end of the wound reaching down in the ...... The patient

of the patient throughout the operation averaged about 136, and she showed marked cyanosis throughout.

The recovery was smooth and uncomplicated.

Pathological Report by Dr. Herndon.

The specimen consists of the right kidney and ureter. The kidney retains its usual shape, but is somewhat enlarged, being 13 cm. long, 6 broad, and 3.5 in its antero-posterior diameter. The upper half is somewhat flattened, dark red in color, except over one or two small pale areas, and is covered by numerous pin-point ecchymoses. On the anterior surface near its upper and outer margin is an oval depression 1.7x0.9 cm. This is surrounded by a zone of ecchymosis, scattered throughout which are a few small yellow tubercles. The surface of the depressed portion is covered by similar tubercles. The lower 3 cm. of the kidney resembles the upper portion and presents a few small tubercles. The remaining portion of the organ is greatly altered in appearance. It consists of a wedge-shaped zone sharply differentiated from the surrounding tissue. Anteriorly it presents a lobulated surface, everywhere studded by minute yellow or translucent tubercles, which are either isolated or occur in small groups. Surrounding the tubercles are numerous pin-point ecchymoses. The corresponding portion of the kidney posteriorly presents a smooth whitish-yellow surface studded with small flattened tubercles.

This portion of the organ is soft and yielding. On section the altered portion of the organ is found to be occupied by four or five caseous abscesses containing thin milky fluid in which caseous material is suspended.

The walls of the abscesses average 2 mm. in thickness. The upper portion of the pelvis of the kidney is smooth and glistening. The remainder presents a few small white tubercles.

Histological Examination: The inner layers of the granulation tissue which form the walls of the abscesses are composed of typical tuberculous tissue, scattered throughout which are a few giant cells. The abscess cavity contains caseous detritus, some of which is clinging to the walls. The tissue in the vicinity of the tuberculous abscesses is greatly altered; some of the glomeruli are partially obliterated by newly-formed connective tissue, others have undergone complete fibrous transformation. The renal tubules where present have an intact epithelium. The connective tissue is markedly increased, and scattered here and there throughout it are numerous aggregations of small round cells, and frequently a tubercle is visible. The pelvis of the kidney is in part involved in the tuberculous process. Sections from the upper portions of the ureter show a slight desquamation of its epithelium and a moderate infiltration of the stroma beneath with polynuclear leucocytes and lymphoid cells. Other portions of the ureter are practically normal. The tuberculous process seen in the kidney has not extended to the ureter. Tubercle bacilli can be demonstrated in the centre of the caseous areas found in the kidney.

Diagnosis : Tuberculosis of the kidney.

Case III.—Mrs. K. W., age 30; case of Dr. Wishart, of Leitersburg, Maryland; married four years, one child three years ago after a hard instrumental labor. In the puerperium she had chills and fever. She has never been quite well since the confinement, and for a year afterward she was a decided invalid. She had had a constant escape of urine since childbirth, resulting from an over-distended bladder. Her mother died of consumption.

As a child she was delicate; at eighteen years of age she had what was called "inflammation of the womb," and was quite ill for seven weeks, during which the lower abdomen was swollen and painful, and there was considerable fever. Her present trouble began ten months after childbirth, that is, two years ago, in October, 1893; the first symptoms were violent pain over the right kidney, extending around to the front of the abdomen and down into the pelvis, accompanied by nausea and vomiting and chills and fever; the suffering was intense for about twenty-four hours. The attacks have recurred at intervals of about three weeks ever since. She has suffered from frequent and burning micturition, but has never passed any stone or blood in the urine. The urine was examined a year ago and found to contain pus. The attacks apparently had no connection with diets, drinks, or exercise. The burning micturition was noticed only just before and during the attacks. Her hands and feet swelled at times and she was puffy beneath the eyes. Her lips and mucous membranes are of a good color, and she is a large, stout woman, whose appetite and digestion are good.

The attacks of pain began under the right shoulder-blade and extended into the kidney, and were violent from the very onset of the first attack. For the past year she has had them as often as three or four weekly, growing more intense. Pain is aching, cutting, piercing, like cutting into the flesh of the groin; when it was most intense she would throw herself about and lie on the floor screaming with agony; she would frequently break into cold sweats. She was never relieved until the doctor came and gave her morphine in large doses. When the attacks passed off she secreted large quantities of urine.

The examination of the urine.—Amber color, opaque with sediment, acid reaction, marked trace of albumen.

Microscopical examination.—Red blood corpuscles abundant; detritus; a few pus corpuscles.

The amount of urine passed varied from 600 to 800 cc. before operation. The vaginal examination showed that the right ureter was converted into a large thick cord, which appeared to be about 1 cm. in diameter and was exceedingly tender on pressure.

Under cystoscopic examination the bladder was found to be perfectly normal in all parts except for *a red mammilated patch about the orifice of the right ureter.* The left ureteral orifice and its surroundings were normal. A short ureteral catheter was laid in the left ureter and the urine secured showed pus cells, and a percentage of urea, 2.1 for the diseased side, and 2.6 on the opposite side, demonstrated to be sound. Tubercular bacilli were not found in the urine.

Operation.—The patient weighed about 225 pounds, and the fat on the abdominal walls was about 7 cm. thick, adding greatly to the difficulty of the operation; the ribs and the crest of the ilium lay so close together that I was obliged to

make a horizontal incision between them. The incision began in front of the posterior vertical muscles and extended 16 cm. across the abdomen in the umbilical line, reaching almost to the right semilunaris. Numerous bleeding vessels were clamped and tied with catgut. One large nerve with vessels accompanying it was divided between the transversalis and the peritoneum in the posterior part of the wound; this nerve was 2 mm. in diameter and ran down toward the crest of the ilium.

The peri-renal fat was freed on all sides of the kidney, completely detached, and brought out of the incision. By drawing it down over the lower lip of the incision the renal vessels were exposed, with the pelvis of the kidney lying beneath them.

An examination was now made to determine first, whether the kidney was diseased at all; second, whether a conservative operation could be done; and third, whether extirpation was necessary.

The capsule of the kidney became almost completely detached in the simple manipulation necessary to bring it out of the incision. The upper and lower portions of the organ looked like a normal kidney substance intensely congested. At the middle there was a zone 3 to 4 cm. wide where the kidney was greatly thickened, being perhaps 2 cm. thicker than at either end. This zone was of a pale color, slightly lobulated, and fluctuated on pressure, showing the presence of considerable fluid within. The peeling off of the capsule disclosed a markedly granular surface over an area about 2½ cm. in diameter on the anterior surface near the pelvis. A similar irregular depressed area with numerous white granules was also seen near the lower pole of the kidney, surrounded by tissue apparently healthy. The case was therefore one of tubercular nephritis, limited to the right side, as shown by the previous examination of the urine separated from that of the opposite side. The broad affected zone extending entirely through the central portion of the kidney rendered any conservative resection impossible. The renal vessels were therefore clamped in three artery forceps 1 cm. from the kidney, after freeing them from the surrounding fat. Each of the vessels was tied with a silk ligature cut short. The vein, which was 8 mm. in diameter, when flattened out slipped from the grasp of its ligature as it sank back into the abdomen, but the compression of the forceps checked a hemorrhage which would otherwise have been excessive. As it was there was a free oozing from both ends of the mouth of the large vein, but it was fortunately found and caught by the forceps again deep down in the abundant fat under the ribs, and another ligature placed about it, using a needle and carrier without drawing it up. Two other small actively bleeding vessels were also tied in the peri-renal fat.

The kidney and the entire ureter were now removed in the following manner. By pulling on the kidney and ureter, the latter was made tense and easily dissected out of its cellular bed, with the index and middle fingers pushing the peritoneum, the ascending colon, and the *caput coli*, to one side and stripping off the loose cellular tissue surrounding the ureter.

This dissection was carried down to the brim of the pelvis, and the common iliac artery could be felt with the tips of the fingers over its entire length, with the thumb resting on the surface of the abdomen, the end of the thumb reaching the anterior superior spine.

I now freed the ureter down to its vaginal portion by introducing the entire hand into the cellular tissue, at first between the peritoneum and the abdominal wall, then under the peritoneum of the false pelvis, and finally between the peritoneum and the walls of the true pelvis. This blunt dissection with the fingers was facilitated by pulling on the kidney and making the ureter tense. In this way I freed it and followed it forward to the broad ligament. At this point considerable resistance was felt, and the ureter appeared to the touch to pass through a hole with a sharp border in its upper part. Above this I distinctly felt the uterine artery pulsating.

At this point, about 6 cm. from the kidney, the ureter broke; the lower end was at once caught in forceps and held, while by dint of pushing and working in my finger I succeeded in freeing about 2 cm. more of the ureter. Before doing this, however, I put a stout silk ligature over the abdominal end of the ureter, and by means of one hand in the pelvis and the other holding the long outside end of the ureter I succeeded in tying a tight knot about it, just behind the broad ligament, then with a long pair of scissors introduced through the abdominal incision and controlled by the hand introduced into the pelvis in the same way, the ureter was cut off one-half centimeter above the ligature, after taking care to milk back any of its contents and to keep the upper end tight squeezed until it was removed.

The vagina was now thoroughly disinfected, and, with the patient still lying on her left side, I passed two fingers of my right hand up to the vaginal vault, and with my left hand introduced into the pelvis through the abdominal incision, I brought both hands together with nothing but the vaginal tissue between them. I now made an opening in the vaginal vault and brought the end of the ureter through it and clamped it in a pair of forceps, until the abdominal wound was closed, when the vaginal end was removed also.

This opening was made in the following manner: I passed my entire left hand through the abdominal wound down into the pelvis and pressed the index and middle fingers against the right vaginal fornix, at the same time lifting up the uterine artery on the index finger so as to avoid any danger of cutting it; the end of the ureter lay between these fingers. The index and middle fingers of the right hand were now introduced into the vagina (the patient was lying in the left lateral posture) and pressed up against the fingers of the left hand in the abdomen, the palmar surfaces of both hands being turned upwards. The opening in the vault necessary to draw the end of the ureter into the vagina was now made by Dr. J. G. Clark, who introduced a pair of sharp-pointed scissors along my fingers up to the vaginal vault and pushed them through the two fingers guided by my instructions; in this I opened the blades of the scissors and withdrew them, in this way enlarging the hole in the vault to about 2 cm. The opening was situated about 2 cm. to the right of the cervix. The bleeding from this torn wound was venous and slight. With a pair of forceps pushed through the vaginal opening, the ligature attached to the ureter was now caught, and the ureter drawn through into the vagina and held there while the abdominal wound was being closed.

Closure of the abdominal incision.—The whole wound-track was first irrigated with normal salt solution; although the bleeding was slight a drain was put in on account of extensive separation of the cellular tissues, and the fear of the accumulation of the products of a serous weeping. The fascia and muscles were brought together by interrupted silver wire sutures, with a gauze drain in the middle, and the fat and skin were closed by buried and subcuticular catgut sutures.

The condition of the patient was excellent, and the pulse as quiet as if no operation had been performed at all; I therefore did not hesitate to put her at once in the lithotomy position and proceed with the extirpation of the remainder of the ureter per vaginam. The end of the ureter and the hole in the vault were exposed by using retractors and catching the right side of the cervix with a bullet forceps and drawing it strongly to the left side. By pulling on the forceps holding the ureter it was made tense, while I cut down through the vaginal wall, at first at the side between the anterior and the lateral walls, and then, curving the incision forwards under the base of the bladder to a point within one and a half cm. of the end of the ureter in the bladder. The ureter was so diseased that it broke off three cm. below the vault, and I had some difficulty in finding the short end in the tissue by the sense of touch and in grasping it with the forceps. There was a free venous oozing from the cut vagina below the vault. The ureter broke once more, and this time at its vesical extremity, and as I could not find the end again I closed the wound and stopped the bleeding by introducing about six catgut sutures, tied tightly; the hole in the vault communicating with extensive cellular area above was left open for an inferior drain, which was now inserted, pushing a piece of iodoform gauze well up into the cavity, and leaving its end hanging down in the vagina.

The recovery of this patient proceeded without a single unfavorable symptom and she has returned home.

PATHOLOGICAL REPORT BY DR. HERNDON.

The specimen consists of the left kidney and ureter. The lower half of the kidney is 6.5 cm. long, 4 broad and 5 thick. It is for the most part of a dark red color, but on its anterior surface presents three pale, slightly elevated areas composed of aggregations of minute yellow tubercles. The remaining portion of the kidney presents a lobulated appearance, and is 6x4.5 cm. in its various diameters. This portion of the kidney is soft and yielding, and on section is found to consist of three or four large caseous abscesses containing thick, creamy, odorless fluid. The lower half of the organ is in most parts normal in appearance, but at one point contains a caseous nodule 1 cm. in diameter. The pelvis of the kidney is smooth and glistening. The ureter is 19 cm. in length. In the vicinity of the kidney it is 5 mm. in diameter, at its vesical end 9 mm. It is firm and somewhat rigid.

Histological examination: The walls of the abscesses are composed of typical tuberculous granulation tissue, lined by caseous detritus. The tissue in the vicinity of the tuberculous abscesses is greatly altered. Many of the glomeruli are completely hyaline, others are compressed by the greatly thickened capsule. The connective tissue is markedly increased,

and scattered here and there throughout it are young tuberculous nodules. The pelvis of the kidney has an intact surface epithelium slightly infiltrated with small round cells. The stroma beneath, however, shows marked small round-celled infiltration. Sections from the upper and middle portions of the ureter are also slightly infiltrated by small round cells. The ureter in the vicinity of the bladder, although dilated, is little altered. The ureter throughout its course shows no trace of the tuberculous process. Tubercle bacilli were found in the wall of the caseous areas in the kidney.

Diagnosis: Tuberculosis of the kidney.

The diagnoses were made in these cases by symptoms, by palpation, by inspection, and by the analyses of the separated urines.

The patients all presented a history of pain in the side, extending down the course of the ureter and accompanied by frequent painful micturition.

In the first case the renal symptoms were masked by the strangury in the bladder.

In the second case the intense pain in the left side, and in the third case, in the right side, accompanied in both cases by attacks of intense renal colic, pointed towards the chief focus of the disease.

By palpation in all cases the pelvic portion of the ureter was found to be enlarged and thickened, but only in the first case did it show any nodular enlargement. There was also in each case a point of tenderness at the place where the ureter crosses the pelvic brim. It was also shown by palpation that the ureter of the opposite side was normal.

By inspection the bladder was shown to be normal excepting around the orifice of the ureter on the diseased side, where there was a reddened granular mammilated appearance.

The separated urines showed that the abnormal constituents of the urine came entirely from the side indicated by this appearance in the bladder, and that the opposite side was sound.

Tubercular bacilli were found in the first case after a patient search; in the second case bacilli, undoubtedly tubercular bacilli, were found which had some of the characteristics of the smegma bacillus. In the third case no bacilli were found and the diagnosis depended upon the history and the physical examination.

The only case I know of in which an entire ureter has been removed is one in which it was taken out piecemeal by two different operations, following the removal of the kidney. This operation is called a ureterectomy by Dr. Reynier, the surgeon, and is not a nephro-ureterectomy as here described. The case was reported to the Surgical Society of Paris, February 15, 1893, and reported in *La Sémaine Médicale,* February 24, 1893, Vol. I, No. 8.

The patient was a man twenty years of age, from whom Dr. Reynier had removed the right kidney, April 27, 1892, for a uretero-pyelo-nephritis. At a later date he took out five inches of the ureter by enlarging the lumbar incision; in spite of this the man continued to suffer, and the effort was then made without success to reach the pelvic end of the ureter by a para-rectal incision. Later he made a suprapubic

FIG. I.—EXTRA-PERITONEAL NEPHRO-URETERECTOMY.

Cadaver with kidney detached and entire ureter separated down to its vesical extremity through the incision shown in the cut, without opening the peritoneum at any point.   April, 1893.   (The cadaver used was male.)

FIG. II.—Diagram showing positions of incisions for extra-peritoneal nephro-ureterectomy (Cases I and II).
The long incision was made in Miss P., and the short incision in Mrs. W.

Fig. III.—Case 3. Mrs. W. Transverse incision. Kidney, girdled by tuberculous zone, brought outside ; vessels exposed in front and ureter behind.

Fig. IV.—Case 3. Mrs. W. Renal vessels divided and ureter freed down to the brim of the pelvis. The object of this picture is to show the ease with which the entire abdominal portion of the ureter can be palpated through a horizontal incision, with only a part of the hand introduced.

Fig. V.—Opening the vaginal vault to bring the extremity of the right ureter through ; the patient lies in the left semiprone position, and the left hand is carried through the lumbar incision behind the peritoneum down to the right vaginal fornix, the ureter stump is held up on the index finger. The right hand is introduced through the vagina to the vault. The assistant then passes the scissors through the vault guided by the operator.

Fig. VI.—Removal of the lower end of the ureter through
the vagina. The ureter is pulled into the vagina through the
puncture made in the vault by the scissors; this opening is
continued forwards in the direction of the dotted line, and
the entire ureter is removed.

incision parallel to the inguinal canal, exposed and removed the lower end of the ureter five inches long, and the patient recovered completely.

In this way three different operations were done. It was not a nephro-ureterectomy such as I am describing here, in which a kidney with a large portion or all of its ureter is removed at one sitting.

The three cases whose histories I have given exhibit three different ways of removing the kidney with its ureter.

First, transperitoneal, that is, through an incision through the abdominal wall opening the peritoneal cavity; this incision involves the necessity of a second incision through the peritoneum, covering the posterior abdominal and pelvic walls, in order to get at the ureter.

Second, retroperitoneal, the extirpation of the kidney and ureter through a long abdominal incision beginning in the loin and extending downwards and forwards and ending somewhere in the neighborhood of the symphysis pubis. By this method the peritoneum is detached from its cellular connection with the abdominal and pelvic walls, lifted up, and the ureter exposed without opening the peritoneal cavity.

Third, retroperitoneal, by a short abdominal and a vaginal incision; by this procedure the kidney is detached and the ureter freed from all its connections through a short incision in the loin, as far forward as the base of the broad ligament. The rest of the ureter is then pulled through an opening made in the vault of the vagina, and removed down to its vesical end by continuing the vaginal incision forwards towards the neck of the bladder.

Two of my friends, Dr. Clinton Cushing, of San Francisco, and Dr. C. P. Noble, of Philadelphia, were present when I performed the second operation. Dr. Cushing suggested removing the ureter through the vagina, and Dr. Noble suggested removing the upper part of the ureter with the kidney through the incision in the abdominal wall, and at a later date taking out the pelvic end of the ureter. This was what I had tried to do in the first case, but I failed on account of the dense inflammatory tissue surrounding the lower end of the ureter.

I look upon the three cases as evolutionary in respect to the best mode of operating, and I would prefer in the future in all cases to operate by an incision in the side large enough to take out the kidney and easily admit a hand and fore-arm introduced for the purpose of detaching the ureter as far down as the vaginal vault. I would then tie the ureter at the lowest point, and remove all that portion with the kidney above the ligature. I would complete the operation by removing the vesical end of the ureter through the vagina, with the patient in the lithotomy position.

TEN CASES OF CANCER OF THE UTERUS OPERATED UPON BY A MORE RADICAL METHOD OF PERFORMING HYSTERECTOMY.

By J. G. CLARK, M. D., *Resident Gynecologist, The Johns Hopkins Hospital.*

Since my report of two cases of cancer of the uterus subjected to a more radical method of performing hysterectomy,* eight cases operated upon by Dr. Kelly and myself have been added to this number.

A review by Dr. Russell of the clinical course of cases of cancer of the uterus operated upon by the vaginal and combined vaginal and abdominal methods, in the Johns Hopkins Hospital between October, 1889, and October, 1895, furnishes valuable data concerning the percentage of recurrence, the inherent tendency of cancer of the uterus to remain localized and not to become metastatic, and its certainty to recur if not widely excised.

The results of Dr. Russell's studies are in the main confirmatory of those of Winter and others, and are a most important and conclusive evidence of the necessity for a more radical operation than any heretofore proposed.

With regard to mortality and regionary recurrence, in 37 cases of cancer of the cervix, the results were as follows: 10 per cent. died from the immediate effects of the operation, 38 per cent. died with recurrence, 5 per cent. were not heard from, and 43.2 per cent. were still alive after a period of one to five years.

In none of the fatal cases could a distinct history of metastasis to other organs be elicited, but all died from local recurrence.

This clinical observation is further substantiated by the records of ten autopsies on inoperable cases, made in the Pathological Department of the Johns Hopkins Hospital, which show metastases in only one case beyond the pelvic and retroperitoneal lymph glands.

In four cases there were carcinomatous deposits in the pelvic and retroperitoneal glands; and in five cases, notwithstanding the most extensive local involvement, there were no metastases.

It is not my purpose at this time to go into the pathological aspects of this question, and these brief statements are only made to point to the necessity for a more radical operation.

The systematic steps laid down in my first article remain practically unchanged, notwithstanding the introduction of certain modifications which have been found necessary for the most complete eradication of the disease in the course of the operations in the eight cases now reported.

The operation is not an easy one, and every detail should be worked out on the cadaver before it is attempted on the living subject.

It requires at least two hours and a half for completion, and on account of the close proximity to the great vessels in the pelvis, especially the external iliac veins and arteries, which must be preserved from injury during the course of the

excision of the broad ligament, is tedious and involves the most painstaking care if the best results are to be obtained. If the operation is carried out properly in all of its details, especially those relative to the dissection of the uterine arteries and ureters, the field of operation must be perfectly illuminated either by the brightest sunlight or a good electric light. The close anatomical relations of the bladder and rectum to the uterus necessarily preclude the possibility of any operation if the cancerous process has invaded either of these organs, but fortunately the tendency of this disease is to extend laterally into the broad ligaments before it invades the walls of either the bladder or rectum, and notwithstanding the rather extensive involvement of the broad ligaments, the operation promises good results if the cancer has not extended outside of its cervical limits anteriorly or posteriorly.

So far we have had no death from the immediate primary effect of the operation, and this result is attributable to the great care observed in immediately checking all bleeding, and preventing shock by keeping the patient warm during the operation, and injecting normal salt solution beneath the breast and into the rectum at its close.

Before referring to the eight additional cases operated upon by this method it is necessary to repeat the summarized steps of the operation as laid down in my original article, making a brief commentary upon the various steps, with especial reference to the modifications which have been added.

Summary of Steps.

1. Insert bougies under the local effects of cocaine, to save time and conserve the patient's vital powers for the operation.

2. Place patient in the Trendelenberg posture and make abdominal incision of sufficient length to insure free manual movements.

3. Ligate upper portion of broad ligament with ovarian artery; divide vesico-uterine peritoneum around to opposite side; push bladder off, and spread layers of ligament apart, exposing uterine artery.

4. *Dissect uterine artery out for 2½ cm. from uterus beyond its vaginal branch, and tie.*

5. Dissect ureter free in the base of the broad ligament.

6. Ligate remainder of broad ligament close to iliac vessels and cut it away from its pelvic attachment.

7. Carry dissection well down below carcinomatous area, even though cervix alone seems to be involved.

8. Proceed on the opposite side in the same manner as on the first side.

9. Perforate vagina with sharp-pointed scissors, making strong traction on uterus with small vulsellum forceps so as to pull the vagina up and make its walls tense, then ligate in small segments (1 cm.), and cut each segment as it is tied.

10. Insert iodoformized gauze from above into raw space left by the hysterectomy; draw vesical and rectal peritoneum over this with a continuous fine silk suture.

11. Irrigate pelvic cavity and close abdomen without drainage.

In the first case reported it was found impossible to insert the bougie into the ureters, and it became necessary to proceed with the operation without this valuable aid.

Cases occasionally occur in which it is very difficult or impossible to insert the bougies or catheters, and it is well to know in what way to proceed safely with the radical operation in the face of this obstacle.

Under these circumstances the time consumed by the operation must of necessity be greater, as the most careful dissection is required to avoid ligating or cutting the ureters.

If, however, Steps 4 and 5, as above given, are carefully followed the ureters can be avoided safely, and a thorough operation can be performed.

In cases in which the uterus has undergone senile changes, the uterine artery may be small and rather difficult to locate. To facilitate finding this vessel in such cases, a little manœuvre which was adopted in one case will be of great assistance.

After exposing the intraligamentary cellular tissue (Step 3), the leash of vessels which radiates from the common trunk of the uterine artery and enters the loose cellular tissue lateral to the uterus is included in one ligature, when the artery back of this point at once becomes distended, turgid, and stands out quite prominently.

The dissection is then carried down along the course of the vessel, with the handle of the scalpel (Fig. I). In this way there is little danger of injuring the vessel, and by confining the dissection closely to the artery it is safely carried over the ureter, which appears as a glistening cord, to the internal iliac artery, where it is doubly ligated and cut.

By watching the ureter for a few seconds its identity is perfectly recognized by the characteristic rhythmical passage from above downward, of peculiar serpentine waves, first noted by Dr. Kelly. The ureter is then barred through its course in the broad ligament, and no fear need be entertained concerning the impairment of its nutrition by a close dissection, as it carries its own vessels. When the ureter is freed it can be lightly drawn out of the field of operation by a traction ligature while the operation is continued, or in some instances a more feasible plan is to push it out of harm's way against the pelvic wall.

The operations performed without the assistance of the bougies in the ureters can be made very thoroughly, but are infinitely more difficult, and are impossible in patients where the abdominal walls are thick and the pelvis deep.

There is the greatest comfort in having the danger of injuring the ureters completely eliminated from the operation by the presence of the bougies, which can be felt distinctly as solid bodies whenever it is necessary to determine the exact location of the ureters. The object of the careful dissection of the uterine artery (Step 4) is two-fold, first, to permit a complete excision of the broad ligament, and second, to render the operation bloodless.

It has been found expedient to modify Steps 6 and 7.

In order to expose most perfectly the lymphatic glands at the bifurcation of the external and internal iliac arteries it is necessary to ligate and cut the broad ligament as close to the pelvic brim as possible.

In some cases, especially where the peritoneum clings closely to the pelvic walls, or is more or less fixed by an inflammatory process, it is found necessary, as one of the final steps in the

operation, to split the peritoneum higher up, at the point where the ureter passes over the brim of the pelvis, in order to gain free access to the glands. This modification will be referred to further on.

After cutting the broad ligament away from the brim of the pelvis close to the iliac vessels, the excision should be carried down towards the pelvic floor, great care being observed to dissect out all of the intraligamentary glandular and cellular tissue with it. Especial attention should be paid to the glands at the bifurcation of the iliac vessels, which may not be visible but can be palpated. These glands should be enucleated with the fingers, and the greatest care must be observed in this part of the operation, as one is in the most dangerous proximity to the external iliac artery and vein. Our usual plan is to leave these glands until the last part of the operation, when it will be found more convenient to remove them as shown in Fig. III. When the excision of the broad ligament has been carried down to a point on the pelvic wall corresponding to a transverse line passing through the vesical orifices of the ureters, it is suspended, and the excision of the base of the ligament, which lies in such close relation with the bladder, ureters and rectum, is completed later from below, upward.

After completing the operation on the opposite side in a similar manner (Step 8), the vaginal puncture should be made.

Especial attention is called to the method of excising the portion of the vagina and base of the broad ligaments which are removed with the uterus.

It is exceedingly important to excise a large cuff of vagina; and to accomplish this with the greatest ease and thoroughness, an assistant should insert his finger into the vagina and definitely locate the margins of the cancer, and then withdrawing the finger at least 2 cm. below this point, make strong pressure upward against the anterior vaginal wall. With this assistance the operator is able to dissect down between the bladder and cervix and vagina, and perforate the vagina at the prominence made by the assistant's finger. In this way a wide area outside of the cancer can be excised.

The vagina is opened with pointed scissors, and the anterior wall is ligated in segments, and cut as far out as the ureters on either side (Fig. II). The ligatures must overlap so that a considerable area of tissue may thus be rendered necrotic and thrown off. This makes the extent of the operation wider than that represented by the excised tissue.

From this point on the operation must be continued with the greatest care. The thumb is inserted through the vaginal opening, if the left side is to be excised, and the index finger is carried behind the posterior layers of the broad ligament, acting as a guide to prevent inclusion of the ureter in the ligature and also to indicate the farthest limit for the excision. By constantly pushing the ureter upward against the bladder with the thumb one is able to continue the ligation and excision well out into the broad ligament beyond the vaginal wall and ureters and thus make the most radical operation possible. Fig. II.

The opposite broad ligament is excised from below in the same way when the uterus, broad ligaments and part of the vagina are removed *en masse*.

Before proceeding to Step 10, the pelvic walls in the region of the bifurcation of the iliac vessels are inspected, and if any glands are palpable they should be removed. We have found the following plan of the greatest advantage in this part of the operation. The gland which is usually most prominent is about the size of a large pea or bean and can be palpated distinctly in the crotch of the iliac vessels.

This is worked out from its bed, and when traction is made upon it, the lymph vessel leading upward is made taut and acts as a guide to the next gland. By this procedure we have been able to remove five glands in one chain. It is not possible to go above the pelvic brim, as the last accessible gland lies at this point; the next group of glands being situated higher up on the vena cava and renal vessels.

In operable cases of cancer the metastases rarely go beyond these glands, and frequently, even in very advanced cases, they are not involved.

A further study of the pathology of this subject may show that the removal of these glands will be of value only from the standpoint of prognosis. If the glands are not readily exposed, a grooved director can be inserted beneath the peritoneum along the course of the ureter, when it can be slit open as far as necessary to make the glands accessible and easily removed.

After enucleation of the glands and adjacent cellular tissue the operation is completed according to Steps 10 and 11.

The analogy between cancer of the breast with its glandular involvement and that of the uterus and its involvement of the broad ligament is apparent to all, and the remarkably good results obtained by the radical operation on the breast and axilla have no doubt turned the attention of many operators to the possibility of a more radical operation for cancer of the uterus.

As evidence of this tendency I find, since the publication of my first two cases, that Dr. Reis[*] of Chicago has worked out experimentally on animals and on cadavers an operation which has for its object the more complete removal of the diseased areas and the pelvic lymph glands.

The operation which Dr. Reis proposed is not described in detail, but I judge from his article that it is similar to the one employed in our ten cases.

Dr. Rumpf[†] of Berlin reports one case of cancer operated upon, as Reis states, according to his method.

REPORT OF CASES.

CASE 3. Gynecol. No. 3823. R. P., admitted 8 24. 95, aged 40 years, black.

Chief Complaint. Pains in back and constant bloody vaginal discharge.

Marital History. Married 23 years, ten children, oldest 22 years, youngest 2 years of age, labors natural, easy, usually in bed 2 weeks after labor.

Three miscarriages, no bad sequel.

Menstrual History. Flow appeared first in her sixteenth year.

* The Chicago Medical Recorder, November 1894.
† Centralblatt für Gynæcologie, No. 35, 1895.
Cases 1 and 2 reported in July-August number of The Johns Hopkins Hospital BULLETIN.

always regular until within last year. Periods are irregular and flow profuse, bright red in color, fluid.

Family History. Good.

Past History. Healthy all her life.

Present Illness. In July, 1894, she ceased to menstruate, but felt very well. About four months later, during sleep, there was an escape of watery fluid amounting to about one gallon. A slight discharge continued, accompanied by a feeling of weakness in her back, but no actual pain. After two months she had a severe hemorrhage, discharging large clots and fatty-looking material. This has continued, but not so profuse, up to the present time. She suffers occasionally from nausea. Abdomen not tender, locomotion slightly painful.

General Condition. Well nourished woman, mucous membranes anæmic, tongue coated, appetite good, bowels regular, micturition at times painful.

Examination. Outlet relaxed. A fungating friable mass about the size of a large orange fills the vault of the vagina. This mass breaks down on the slightest touch and gives rise to free bleeding. The carcinomatous process involves the entire cervix and extends 1 cm. into the vagina. The broad ligaments are apparently not involved.

Diagnosis. Carcinoma of cervix and vagina.

Operation by Dr. Clark, Oct. 3, 1895. Removal of uterus, broad ligaments and part of vagina, with enucleation of pelvic lymph glands.

Catheters inserted into ureters without difficulty. Operation carried out in all of its details. Pelvic lymph glands, apparently enlarged, dissected out above the brim of the pelvis. A cuff of apparently healthy vagina 2 cm. in width removed with uterus.

Note. This case would have been considered a favorable one for vaginal hysterectomy by many operators, as the broad ligaments did not seem to be involved. The dissection of the uterine arteries, however, showed carcinomatous tissue in the broad ligaments. Pelvic lymph glands also appeared to be involved.

Case 4, Gynecol. No. 3888. M. C. D., admitted 10, 17, 95, aged 48 years, white.

Chief Complaint. Bloody vaginal discharge.

Marital History. Married 32 years, eight children, labors not difficult, no apparent sequelæ, youngest child 7 years old. Five miscarriages at various times between the births of her children, none since the birth of last child.

Menstrual History. Began at 12 years, regular, flow free, lasting 4 to 5 days, painless. Became irregular 4 or 5 years ago, flow not appearing for 4 or 5 months at a time. Two years ago it began to appear more frequently and to last longer than earlier in her menstrual life. A year ago the flow became prolonged and copious, lasting two to three weeks, and frequently ending with a free hemorrhage. Since January, 1895, flow has been almost continuous.

Leucorrhœa. When free from bleeding she has a copious offensive yellowish discharge.

Family History. Negative.

Personal History. Hemorrhage from stomach and bowels 15 years ago.

Present Ailment. Constant backache for last year, and for the last few weeks she has had a dull aching sensation in her lower abdomen. History of hemorrhages (*vid. sup.*).

General Condition. Very anæmic, but patient says she does not feel debilitated. She is of very spare habit, but says this is her normal condition. Tongue clear, bowels constipated, appetite good.

Examination. Outlet relaxed, vagina contains fetid bloody discharge. Cervix has been entirely excavated and in its place is a deep punched-out ulcerated pit, which extends upward to the cervico-fundal juncture, outward at least 1½ cm. into the broad ligament, and downward as a ragged area for 2½ cm. into vaginal wall.

The ureters seem to be surrounded by the carcinomatous process.

Diagnosis. Cancer of cervix and vagina involving the broad ligaments extensively.

Operation, Oct. 18, 1895, by Dr. Clark. Removal of uterus, broad ligament and 3 cm. of vagina, along with enlarged lymph glands on pelvic walls.

Ureters catheterized before administration of anæsthetic without the slightest obstruction to the entrance of catheters, showing that they were not as extensively involved as at first appeared by the vaginal examination.

Operation much more satisfactory than had been anticipated, as it was found upon opening the abdomen that the carcinoma had involved the broad ligament quite extensively but had not reached the ureters. A very thorough dissection was made, and the carcinomatous tissue in the broad ligaments and vagina was apparently entirely removed. The pelvic lymph glands were not enlarged and appeared normal.

Unfortunately the cancer had extended so far anteriorly and posteriorly that the bladder and rectal walls were probably involved.

At the completion of the operation the patient's pulse was 150, but under the influence of an enema of 1 liter of salt solution and the injection of a similar quantity under the breasts, it quickly dropped to 90 after she was returned to the ward.

10, 24. Vaginal gauze removed, no discharge. Patient has had incontinence of urine since the operation, although she voids almost a normal amount.

General Condition. Steadily improving. Symptoms in every way favorable. Temperature 101°, pulse 110.

11, 10. Patient has made a rapid convalescence. Slight incontinence of urine, but much less than when previously noted.

11, 26. Patient discharged. Still has slight incontinence of urine. General condition excellent.

Vaginal wound perfectly healed. No apparent disease visible.

Bladder carefully examined and ureters catheterized to prove definitely that the incontinence did not come from a ureteral fistula. Both ureters found to be normal.

Incontinence probably due to a slight paralysis of the *sphincter urethræ.*

Feb. 24, 1896. Patient's husband reports to-day that his wife is apparently well, has gained in flesh and strength, and is able to do all of her house work. Incontinence quickly passed away after she returned home.

Note.—This case represents the extreme limit of the operation for the radical removal of cancer of the uterus. Prognosis as to cure unfavorable, but as to relief of symptoms and prolongation of life good.

Case 5, Gynecol. No. 3923. E. J. C., admitted 10, 30, 95, aged 53 years, white.

Chief Complaint. Bloody vaginal discharge.

Marital History. Married twice, the first time 30 years ago, the second time 17 years ago. One child, 23 years of age, labor easy, no bad sequelæ. One miscarriage in the second month 25 years ago.

Menstrual History. Began at 16 years, regular, flow free, lasting 4 to 5 days, without pain. Climacteric one year ago.

Leucorrhœa. For the last few months she has had a thick, yellowish, irritating and offensive discharge.

Family History. One sister dead of phthisis, grandfather had a cancer, otherwise history negative.

Personal History. Healthy as an adult, except an attack of rheumatism four years ago.

Present Ailment. For the last four or five months has had a yellowish discharge, which has lately become blood-tinged. The latter has steadily increased, never amounting to a hemorrhage, but only a slight oozing, more marked after exertion. She has had no pain. Defecation at times painful.

General Condition. Patient has lost flesh and strength in the last six months. Appetite fair, bowels regular.

Examination. Outlet normal (parous). Cervix excavated by ulcerative process, the normal outlines of the cervix being entirely obliterated, and in its place there is a deep pit which extends up to the cervico-fundal juncture, and out into vaginal walls. Bladder and rectum apparently not involved. Broad ligament slightly fixed and indurated.

Diagnosis. Cancer of cervix and vagina, extending out into broad ligaments.

Oct. 31, 1895. Preliminary curettement without ether, all redundant tissue removed and vagina cleansed.

Nov. 2. Operation by Dr. Kelly. Removal of uterus, broad ligaments and part of vagina, also lymph glands at brim of pelvis.

Bougies inserted before operation. Details of operation carried out in full.

Patient lost no blood during operation, and was returned to ward with a pulse of 112. Saline injection under breasts and salt solution enema of one liter given. Incision closed with buried silver wire and subcutaneous catgut sutures.

Nov. 10. Vaginal gauze removed. Patient has had no nausea or vomiting following operation.

Nov. 11. The incision broke down and discharged a large amount of pus. General condition of patient very good.

Nov. 24. Incision perfectly healed without removal of silver sutures.

Dec. 3. Patient discharged to-day. Examination in the knee breast posture shows the vaginal vault almost completely healed. A small point of cleavage is still present, which is covered with granulation tissue. Imbricated sutures are seen well outside of the limit of granulation tissue.

So far as now demonstrable the result is satisfactory. Patient has made an ideal recovery, with the exception of the suppuration of abdominal wound.

CASE 6, Gyn. No. 3980. M. K., admitted 11, 4, 95, aged 44, white.

Chief Complaint. Constant vaginal discharge of yellowish or bloody matter.

Marital History. Married 29 years, five children, labors normal, three miscarriages, no bad sequelæ.

Menstrual History. Menstruation began at fifteen years, regular, not painful, duration usually four days, but for last two years a day has occasionally intervened during the menstrual flow when the discharge has ceased.

During the past year the flow has occurred at times every two weeks. Two months ago the flow was very copious, amounting as the patient thinks to a hemorrhage. Last period one month ago, of short duration and very scanty. Since last period constant hemorrhagic discharge. Menstruation previous to last two years has been copious, at times discharged in large clots.

Family History. Negative.

Personal History. Measles when a child. Has never been strong.

Present Condition. In June, 1895, patient first noticed that menstrual flow became more or less constant. It has continued without cessation up to the present time, and has increased rapidly in the last three weeks. Discharge is brownish, very fluid, offensive and irritating.

General Condition. Has lost about 20 pounds in past year. Appetite good, marked anæmia, patient feels weak and languid, bowels constipated, micturition painless.

Examination. Outlet greatly relaxed. Filling fornix of vagina and projecting half-way down into the vagina is a fungous mass about the size of a fœtal head. The mass bleeds on the slightest touch, is very friable, and the odor from the discharge is very offensive. The carcinomatous process has destroyed the cervical portion of the uterus, but the vaginal walls seem to be but slightly involved. Vesical and rectal walls not encroached upon. The broad ligaments are apparently involved as far out as the ureters.

Fundus uteri normal in size, freely movable and not adherent. Appendages normal.

Diagnosis. Cancer of cervix extending into broad ligaments.

Operation, Nov. 7, 1895, by Dr. Clark. Removal of uterus with broad ligaments and part of vagina.

Ureteral catheters introduced before ether was administered. The right ureter was catheterized with great difficulty on account of an apparent constriction of its lumen, and during the cleansing of the vagina the catheter slipped out into the bladder, but with the aid of the catheter on the opposite side the operation was completed without great difficulty.

Preliminary curettement of cervical mass attended with much hemorrhage, requiring a tight pack to control it while the abdomen was being opened and the uterine arteries ligated.

Uterine artery senile, requiring a ligature around its branches close to the uterus to make it stand out prominently.

On the right side the carcinomatous process had extended out farther than on the left.

Lymphatic glands in broad ligament not enlarged, and apparently not the seat of metastasis.

Pulse at completion of operation 108, no blood lost during the hysterectomy.

On account of great anæmia and liability to shock, 1 liter of normal salt solution was injected beneath the mammary glands, and 1 liter of salt solution given by enema.

Abdomen closed with buried silver wire and subcutaneous catgut sutures.

Nov. 8. Patient has complained of no thirst, pulse 60, full and strong, rapid recovery from ether.

Nov. 13. Vaginal gauze removed without difficulty.

Nov. 16. Abdominal incision perfectly healed. General condition excellent.

Dec. 5. Patient discharged. Vaginal vault healed with the exception of one small area which looks suspicious.

Note.—On account of the wide extension of the disease on the right side this case is considered unfavorable for permanent cure.

CASE 7, Gynecol. No. 4031. A. A. L., admitted 12, 19, 95, aged 41 years, white.

Complaint. Backache and a constant irritating watery discharge.

Marital History. Married at 17 years of age, two children, oldest 21 years, youngest 19 years. Labors normal. One miscarriage 18 years ago.

Menstrual History. Menstruated first at 13 years of age. Always regular until two years ago. Since that time irregular (see *Present Illness*).

Leucorrhœa. Has had a slight discharge for several years; for last six months this has assumed a watery consistency and is slightly tinged with blood.

Family History. Good.

Past History. Always strong and healthy until present illness began.

Present Illness. Began with a hemorrhage about one and one half years ago while nursing a sick member of the family. This occurred at a regular period, and she gave but little thought to it. The next menstrual epoch was ushered in the same way, the flow continuing more or less profuse for five weeks. Flow then appeared regularly once a month for [...] a few days after the appearance of a [...] hemorrhage, which occurred regularly [...] [...] has had [...] discharge in the intervals.

[...] tion normal, appetite poor. Fairly well nourished, mucous membranes pale and anæmic.

[...] uteri seems only slightly if at all involved. The disease reaches

within 1½ cm. of the os uteri, which is slightly lacerated but not infiltrated. A small mucous polyp hangs from the cervix. The infected area has a typical carcinomatous appearance, the central portion is necrotic, white, and exhales a fetid odor. The margins are raised and are of a pinkish color, and there is a sharp line of demarcation between it and the surrounding mucous membrane. The entire upper third of the vagina and the upper part of the middle third are involved, and the disease extends over into the right lateral wall. Rectal examination shows no extension of the disease in that direction. Uterus and appendages normal.

Diagnosis. Carcinoma of vagina extending up into right vaginal fornix, and involving broad ligament.

Operation, Dec. 23, 1895, by Dr. Kelly. Removal of uterus, broad ligaments, infected portion of vagina, and accessible pelvic lymph glands.

Black rubber bougie inserted into ureters before the administration of ether.

In this case the usual steps of the operation were departed from, in that the carcinomatous area in the vagina was first outlined by an incision, and partly dissected up to the vaginal fornix, after which the abdominal incision was made and the operation completed in its usual way. It was attended by more bleeding than usual on account of the extreme vascularity of the vaginal walls.

The lymph glands on the right side were enlarged and distinctly palpable. A chain of five glands was dissected off from the bifurcation of the external and internal iliac vessels.

At the completion of the operation, while the ureter on the left side was being pushed to one side, the bougie suddenly broke close to the bladder with an audible snap. Dr. Kelly attempted to push the broken end down into the bladder and catch it with forceps introduced through the urethra, but this proved impossible. He then pushed it back to its former location, and splitting the ureter open longitudinally, withdrew it. The incision was neatly closed with one fine silk mattress suture, without occluding the ureter or diminishing its caliber. Since this accident, hard rubber bougies have been discarded and the English catheter substituted.

At the completion of the operation the patient's pulse was 140 and weak, but it improved at once under the effects of the submammary injections and rectal enema of normal salt solution. Her pulse when she returned to the ward was 128. Incision closed with silver wire and subcutaneous catgut.

Dec. 24. Patient has had considerable pain and nausea. The question of occlusion of the ureter is certainly eliminated by the fact that she has passed twelve hundred cubic centimeters, or a normal amount of urine within the last 24 hours.

Dec. 29. Patient has been exceedingly nervous and complains of great pain. Temperature 100° F., pulse 90. No tenderness or tympanitis. Bowels have moved very satisfactorily. Vaginal gauze removed, slightly blood-stained.

Dec. 30. Abdominal incision separated on account of the breaking of one of the silver wires. Cocaine was at once applied and the edges of the wound were brought together with penetrating silkworm-gut sutures.

Jan. 27th, 1896. Patient has made a steady recovery since the last note and is discharged to-day. The vaginal wound is not entirely healed, but appears perfectly healthy.

CASE 8, Gynecol. No. 4056. G. H., admitted 1, 4, 96, aged 34 years, white.

Complaint. Bloody vaginal discharge.

Marital History. Married 14 years, five children, all labors easy except fifth, which was very tedious. Last labor 3 years ago. Three miscarriages—first in the seventh month, second in the sixth month, and third in the fifth (twin pregnancy), occurring in June, 1895, 1 fœtus macerated, the other living at birth.

Menstrual History. Menses began at 13 years, regular, painless, flow moderate, never clotted previous to July, 1895. Since then the discharge is always clotted and offensive.

Leucorrhœa. None.

Family History. Negative.

Personal History. Always healthy up to July, 1895.

Present Ailment. In July, 1895, one month from the time of her last miscarriage, she began to have a discharge of clotted blood, which increased in frequency and amount until three months ago, when her physician excised part of the cervix. She was temporarily relieved, but flow again appeared and continued up to seven weeks ago, when the cervix was curetted, followed again by slight checking of the discharge.

The discharge is now thick, pinkish and offensive.

General Condition. Has lost considerable flesh. Is of spare habit, anæmic, anxious expression, appetite good, bowels regular, micturition painless.

Examination, Jan. 8, 1896. Outlet moderately relaxed. Projecting from anterior and posterior lip of cervix is a fungating mass, about the size of an egg, which bleeds on touch.

It is almost entirely limited to the cervix, and only projects slightly into anterior and posterior vaginal walls. Fundus uteri slightly enlarged, movable, appendages normal. Broad ligaments do not seem to be involved.

Diagnosis. Cancer of cervix.

Operation, Jan. 8, by Dr. Clark. Removal of uterus, broad ligaments and a wide cuff of vagina, and pelvic lymph glands.

Bougies inserted under the influence of cocaine without difficulty before etherization.

This operation was uncomplicated, and so far as macroscopic appearances of the removed specimen, all of the disease was removed.

Submammary injections of salt solution and rectal enema of 1 liter of salt solution given. Pulse at completion of operation 140 and very weak. In two hours it had dropped to 90 and was full and strong.

Jan. 10. Patient reacted well from operation.

Jan. 16. Vaginal pack removed without difficulty. Patient has been a victim of the morphia habit before she entered the hospital, and suffered greatly from the withdrawal of the drug after operation.

Feb. 8. Patient has made an uneventful recovery. She has increased in weight; her expression is now good, color of skin and mucous membranes greatly improved. General condition excellent.

Examination shows the vaginal vault to be completely healed and there are no apparent remains of the cancer left.

CASE 9, Gynecol. No. 4070. E. P., admitted Jan. 11, 1896, aged 43 years, white.

Complaint. Pain in the lower right abdomen and across kidneys. Almost constant bloody vaginal discharge.

Marital History. Married 26 years. No children and no miscarriages.

Menstrual History. Began at 13 years, always regular, periods occurring every fourth week, not painful, amount moderate, lasting one to two days, bright red, not clotted. Last period Jan. 1, 1896.

Leucorrhœa. For last 10 years, profuse yellowish-green, non-offensive, irritating discharge.

Family History. Negative.

Personal History. No illness since maturity up to the beginning of this ailment.

Present Condition. First noticed pain in left lower abdomen two years ago, occurring suddenly as a sharp cutting pain, which has gradually grown worse, and has often confined her to bed for three days to one week at a time. During attacks pain may be "sharp or dull thudding," does not radiate.

Patient lies on left side with left thigh flexed upon the abdomen. Nausea and vomiting are at times present, though not confined to attacks. Tenderness is more marked during attacks.

When walking she limps and inclines the body forward. Pain

Fig. I.—Method of dissecting uterine artery out to its origin. Ureter is seen passing immediately beneath uterine artery.
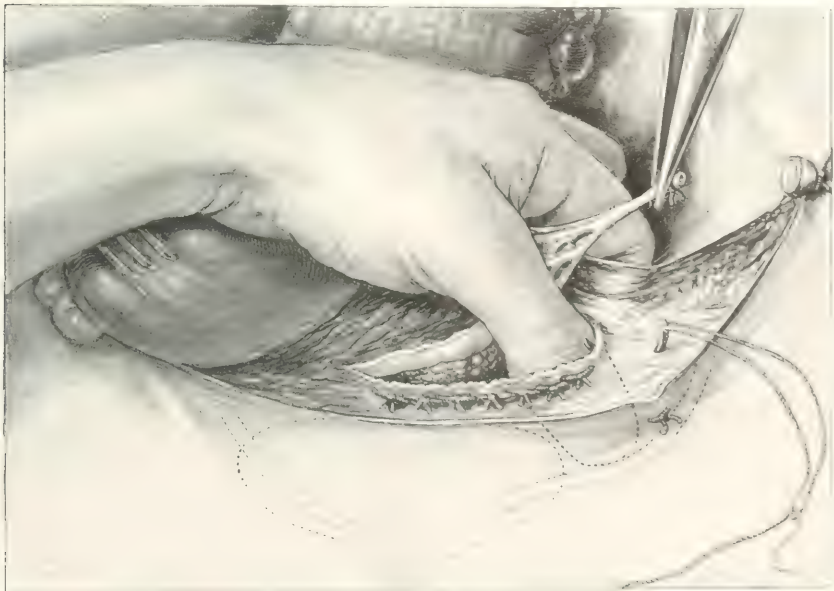
Fig. II.—Uterine artery doubly ligated and cut. Forefinger posterior to broad ligament then inserted through vaginal incision pushing ureter towards pelvic wall, thus permitting a wide excision of the broad ligament.
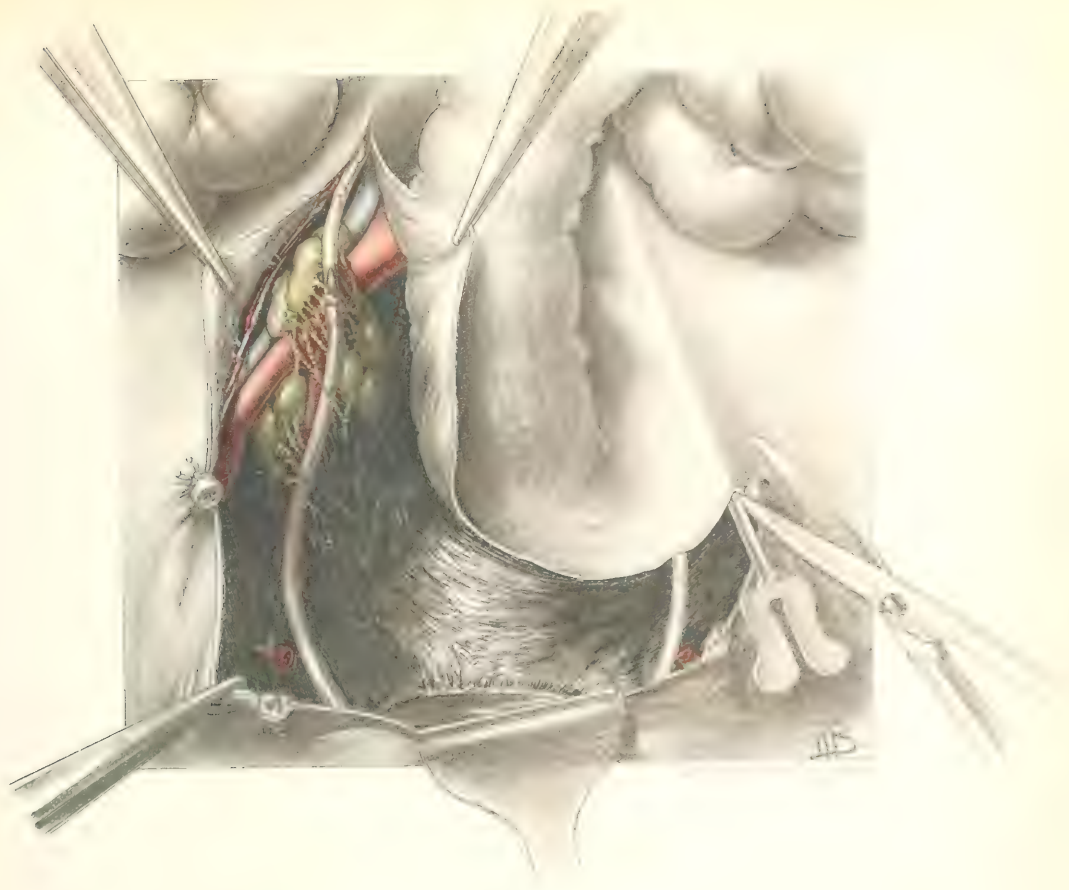
Fig. III

RADICAL OPERATION FOR CANCER OF THE UTERUS.

ON THE LEFT SIDE THE METHOD OF SPLITTING THE PERITONEUM IS DEMONSTRATED, WHILE ON THE RIGHT THE PERITONEUM IS LAID OPEN, EXPOSING PELVIC LYMPH GLANDS AT THE BIFURCATION OF THE INTERNAL AND EXTERNAL ILIAC VESSELS; ALL THESE GROUPS OF LYMPH GLANDS ARE SELDOM ENLARGED IN ONE CASE. BOUGIES HAVE BEEN INSERTED IN THE URETERS, WHICH STAND OUT PROM LIGATED

"across the kidneys" began two years ago, and has gradually increased until the present time, when it is a constant ache, which at times is increased to sharp, cutting pain. During these exacerbations of pain the vesical distress is increased, causing frequent voiding of small amounts of urine, which is accompanied and followed by pain and burning.

For past year micturition has been increased in frequency. Retention of urine is painful.

Bloody vaginal discharge began two years ago, at first at variable intervals, but for past year is constant. At first bright red, it varies at present between pink and dark red.

Two months ago she had a larger hemorrhage than usual, discharging a pint of clotted blood.

General Condition. Has lost flesh, fairly well nourished, color not good as formerly. Patient looks much older than the age given (43 years). Appetite good. Bowels constipated. Urine contains a moderate number of pus and epithelial cells.

Examination. Outlet intact, cervix excavated with jagged ulceration, leaving a shell-like margin. This ulcerative process is confined to cervix and has not invaded the vaginal walls.

The broad ligaments appear to be free. Fundus in retro-position freely movable.

Considerable pain on pressure in left ovarian region. Appendages normal.

Diagnosis. Cancer of cervix.

Operation, Jan. 15, by Dr. Kelly. Removal of uterus, broad ligaments, part of vagina and pelvic lymph glands.

Ureters catheterized before administration of ether. Details of operation carried out as usual. A very thorough dissection of intraligamentary and pelvic cellular tissue with the lymphatic glands and vessels. Cancer was found to run out closely to the ureters, and appeared to involve the bladder at these points. The muscular coat of bladder was slightly lacerated, bnt not more so than in former operations. At the completion of the operation the patient was in a very good condition, considering the extensive operation to which she had been subjected.

The usual submammary injection of 1000 cc. of salt solution and a rectal enema of 1000 cc. of salt solution were given.

Incision closed with buried silver wire and catgut.

Jan. 19. Patient has reacted well from the operation. Pack removed and found covered with a slight bloody discharge.

Jan. 22. For the last few days patient has complained of incontinence of urine, with burning pain on micturition. Temperature 99° F. and pulse 90. Patient weak and drowsy.

Jan. 27. Line of incision perfectly healed. Condition otherwise almost same as noted above. Vesical irrigations bring away considerable amount of pus and flaky matter.

Feb. 1. Incontinence continues the same, vulvæ excoriated and red. External genitals bathed with boric acid solution and covered with zinc oxide ointment. Patient's general condition worse.

Feb. 7. Patient very weak and drowsy, expression listless, complete incontinence of urine.

Feb. 10. Patient is now suffering intense pain in bladder and rectum. Condition growing worse rapidly.

Feb. 12. Patient died suddenly this morning.

Autopsy, Feb. 13, by Dr. Flexner.

Anatomical Diagnosis. Operation wound for extirpation of uterus and broad ligament; sloughing cystitis and pericystitic infiltration (purulent). Rupture into rectum. Purulent proctitis. Ascending pyelo-nephritis.

Surface. Body 146 cm. long, slightly built, greatly emaciated, abdomen scaphoid, no subcutaneous œdema.

Mucous membranes of conjunctiva pale.

In midline of body from umbilicus to symphysis, linear scar 14 cm. long, completely healed.

Omentum. The omentum is adherent to under surface of incision by delicate fibrous adhesions; with this exception, the omentum is free; it contains a small amount of fat.

Peritoneum. Peritoneal cavity does not contain any excess of fluid. Intestines free from adhesions, serosa delicate, perhaps a little granular, especially on the jejunum.

Mesenteric glands not enlarged, but through mesentery appear congested. Delicate adhesions between one of the lower loops of the ileum and the stump of the ovarian vessels on the right side.

Appendix. Normal.

Sigmoid flexure. The sigmoid flexure projects to the right side and is bound by very light adhesions to the peritoneum over the iliac muscles, by firmer adhesions to the bladder. On breaking these adhesions to the bladder this is noticed to be much discolored, of a greenish and in places almost black hue, which extends to the peritoneum covering the sigmoid flexure.

The seat of operation is apparently in perfect condition, the peritoneum is firmly united, and the catgut suture joining the vesical and rectal reflections of the peritoneum is not yet absorbed.

Heart. Normal.

Lungs. Normal.

Spleen. Small, but appears normal.

Left kidney. Free from adhesions. Is not markedly dilated. Capsule is adherent; in some places corresponding to the adherent areas the surface is granular.

The cortex generally has a slight pinkish tint in which there are many white elevated nodules, varying in size from a miliary tubercle to lines and dots of sand. On section these agree with linear lines of varying width extending upwards from pelvis.

Pelvis dilated, mucous membrane thickened and congested and shows numerous ecchymoses.

Pelvis contains greenish thick pus.

Ureter dilated to size of a large quill, mucous membrane much congested, thickened and contains small ecchymoses.

Right kidney. Somewhat larger than left, capsule firmly adherent. Pelvis not dilated, but mucous membrane thickened, ecchymotic and very hyperæmic. Kidney a mass of small and confluent abscesses; on section of these, pus escapes only occasionally. It seems to be a diffuse interstitial infiltration rather than localized abscess-formation.

Bladder. Bladder is fixed to pelvic wall and cannot be removed without more or less tearing of its substance. On both lateral walls the soft tissues are necrotic, pigmented and gangrenous in appearance, as deep as the bony structures. A considerable amount of semi-fluid pus escapes on exerting the slightest pressure on the tissues about the bladder on either side; there is more, however, on the left than right. The bladder itself has thickened walls; its mucous membrane is a pultaceous pigmented purulent mass. There are some mineral concretions in the dark pus which covers the surface.

Left ureter is evidently occluded at its point of entrance into the bladder, but is certainly not included in a ligature.

Intestines. The jejunum is pale and moderately distended. The ileum is contracted. The large intestine is normal. Mucous membrane of the rectum covered with pus, and in its middle third there is an opening communicating with pericystic abscess and bladder. Processes. Pale and firm.

Stomach. The mucous membrane is pale.

Duodenum. A few small congested patches.

Œsophagus. Normal.

Liver. Small, free from adhesions. On section somewhat mottled. Central veins very distinct. Weight 960 grams.

Gall bladder. Moderately distended with thick dark bile.

Glands. A ……… in the abdominal cavity, ……… could be found, were ……… and examined ………

The retroperitoneal, above the pelvic brim as well as those in the abdominal cavity, especially the glands lying upon the external iliac vessels and between these vessels and the psoas muscle, were removed. In no case were they found to contain metastases, nor were they perceptibly enlarged.

The absence of metastases refers to the examination by the

unaided eye. It will be necessary to make sections to exclude metastasis with certainty.

Microscopic Examination. Lymph glands normal.

CASE 10, Gynecol. No. 4143. M. E., admitted 2, 11, 96, aged 33 years, white.

Chief Complaint. Bloody vaginal discharge.

Marital History. Married 17 years, seven children, labors usually long and tedious, especially the first and sixth, non-instrumental. Twin births at one labor.

Attended in confinements by a midwife. Laceration of perineum during first labor. Last labor 3 years ago. One miscarriage in December 1895, no ill effects.

Menstrual History. Flow began at 14 years, regular every fourth week up to 3 years ago. For past three years periods have been exceedingly irregular, varying from one to two months apart. During last six months she is unable to differentiate the menstrual flow from an almost constant hemorrhage which she has had.

Leucorrhœa. During the last six months she has had a profuse, yellowish, non-irritating, offensive discharge, when the bloody discharge was not present.

Family History. Negative.

Personal History. Since maturity no definite illness, but patient has never felt perfectly well.

Present Condition. First noticed bloody vaginal discharge about six months ago, at which time it was very scanty, but has continued almost constantly since that time. At times the flow is very profuse, coming in gushes which vary in amount from ½ to 1 pint.

General Condition. Has lost some flesh, but is still a very stout woman, weighing about 190 pounds. She is very anæmic, appetite good, bowels constipated, micturition normal.

Examination. Outlet considerably relaxed, cervix occupied by a fungating mass which is about the size of a base-ball, and projects half-way down into vagina. This mass springs from the posterior lip of the cervix and has apparently not spread beyond this point. The tissue is very friable and breaks down under the lightest touch. Uterus movable, not adherent. Appendages normal. Broad ligaments do not seem to be involved. The abdominal walls are very thick, and hang pendulous in a large fold.

Diagnosis. Cancer of cervix.

Operation, 2, 13, 96, by Dr. Clark. Removal of uterus, broad ligaments, a cuff 3 cm. in width of vagina, and the pelvic lymph glands.

Catheters inserted into ureters without difficulty before etherization. In this case the operation would have been impossible without the catheters in the ureters, as the abdominal walls were thick, 8 cm. (3 in.), and the pelvis was very deep, which rendered the operation exceedingly difficult.

The entire web-like structure of lymphatics with numerous glands were removed from the lateral pelvic walls, and the vagina was widely excised around the margin of the cancer. The operation required three hours to complete it. The patient's pulse was 146 when she left the table, but under the influence of the salt enemata and injection beneath the breasts, quickly dropped to 110, and the patient recovered rapidly from the anæsthesia without the slightest sign of shock.

SUB-ACUTE AND CHRONIC CYSTITIS TREATED BY THE VESICAL BALLOON.*

By J. G. CLARK, M. D., *Resident Gynecologist, the Johns Hopkins Hospital.*

The most frequent cause of cystitis is catheterization of the bladder without proper observance of aseptic details, in post-operative and obstetrical cases.

The highly concentrated urine excreted for the first few days after surgical operations, especially after the more serious abdominal sections, gives rise to needless irritability of the bladder and renders frequent catheterization necessary.

A series of observations made by Dr. Russell on the urinary excretion for the first five days subsequent to cœliotomy shows a great diminution in the normal amount of fluids with an increase in the solids of the urine. If, in addition to this chemical irritant, infectious matter is introduced into the bladder by the catheter, the most favorable conditions are present for the production of a serious inflammation. The rigid technique in catheterization insisted upon by modern surgeons fortunately renders this complication comparatively rare, and the chronic forms of cystitis as a rule date the onset of the attack to a specific infection or a badly conducted puerperium.

The acute forms of cystitis usually yield to treatment, if taken in hand at once, by mild vesical irrigations and diuretics, as it is only necessary to eliminate the cause of irritation, which is readily reached by these means, to cause a subsidence in the inflammation.

The method of treatment which I am about to describe is not advised in these simple acute cases; but in the sub-acute

or chronic cases it finds its field of usefulness. The unsatisfactory results of treatment of these obstinate ailments by the usual therapeutic remedies are universally acknowledged by all physicians and surgeons.

The late Professor Goodell, of the University of Pennsylvania, in his remarks preceding the details of treatment of chronic cystitis, usually spoke of the extreme persistence of the inflammation and the difficulty of curing it, a statement fully confirmed by the large number of remedies which he afterwards suggested for its treatment.

The one symptom common to all forms of cystitis is frequent and painful micturition, due to the expulsive efforts of an inflamed bladder, excited either by a slight distension of the bladder or by the presence of irritant salts in the urine.

If the acute inflammation is not soon relieved the bladder remains contracted, the mucous membrane becomes congested and thickened, new connective tissue is formed in the vesical walls, the rugæ are much more prominent than normal, and the intervening sulci conceal septic matter which cannot be reached by irrigation, as the moment the fluid begins to distend the bladder such acute pain is produced that the bladder contracts with great force and prevents it even coming in contact with the deeper parts, much less washing away or rendering innocuous the concealed pus. As evidence of this, one can see almost immediately after the most thorough vesical irrigation with a two-way catheter, small quantities of urine voided, highly charged with pus, desquamated epithelium and other degeneration products.

It is to overcome this difficulty in reaching the source of infection that the vesical balloon is especially valuable.

At one of Dr. Kelly's clinics given during the meeting of the American Medical Association, in May, 1895, I exhibited an improvised apparatus, made by attaching a toy balloon to an English catheter, and demonstrated its method of application. Since then special balloons have been made which have proved in every way satisfactory.

By means of this apparatus the bladder is distended, the rugæ smoothed out and all of the inflamed and infected areas are brought in contact with the vesical balloon, which is employed as the carrier of therapeutic remedies.

Rubber balloons have been introduced into the bladder and inflated preceding the repair of vesical fistulæ, to facilitate the operation, but so far as I am able to glean from medical literature, this is the first employment of such an apparatus for the treatment of cystitis.

THE VESICAL BALLOON.

The apparatus consists of a small balloon made of thin rubber, 6 cm. in diameter when collapsed, connected with a thicker rubber tube 26 cm. in length, with a small cut-off valve or clip to retain the air when the bag is inflated. These balloons can be distended to about the size of a well-filled normal bladder.

We have employed the usual surgical aspirator as the most convenient means for inflating the balloon, but the small rubber bulbs connected with nasal atomizers, or a cheap air-pump like the bicycle-pump, would probably be equally satisfactory.

The balloons are made of delicate rubber tissue, and if not carefully preserved are soon destroyed. They should be washed in warm water immediately after use, and then slightly inflated and allowed to dry thoroughly, in order to prevent the walls of the collapsed balloon from adhering together.

When the apparatus was in its experimental stage we used the oleaginous ointments, which were quickly found to decompose the rubber, and at the suggestion of Mr. Waltz, pharmacist to the Johns Hopkins Hospital, gelatine was tried, which at once proved an ideal vehicle for the various medicaments.

Gelatine possesses the advantages of melting at the body temperature and not injuring the rubber, and when brought in contact with the mucous membrane of the bladder is quickly absorbed.

Up to the present time we have found a ten per cent. ichthyol gelatine very satisfactory. In addition to this we have had made up a bismuth, zinc, salicylic acid and bichloride gelatine, but so far have had no occasion to use them.

METHOD OF APPLYING THE VESICAL BALLOON.

Before using the balloon it should be boiled and placed in a boric acid solution or in sterilized water. The capacity of the balloon should always be accurately determined previous to its use, by inflating it to the size desired, and counting the number of cylinders or bulbs of air required to fill it.

By observing this precaution there is no danger of over-distending the bladder, as the exact degree of distension is determined by the number of cylinders of air introduced.

The external urethral orifice and surrounding parts are cleansed with soap and water and bichloride solution (1 to 1000) by the nurse, after which the bladder is catheterized and the patient placed in the knee-breast posture, carefully protected by a sheet.

The patient should lie with chest flat on the table, her arms hanging over the sides, in order to make the bladder distend perfectly when the speculum is introduced.

A small pledget of cotton rolled on an applicator is saturated with a twenty-per cent. solution of cocaine and inserted into the urethra and allowed to remain for 3 minutes, when a No. 10 vesical speculum can be introduced without giving the patient much pain. Frequently the patient complains of no discomfort whatever until the end of the speculum impinges upon the inflamed mucous membrane of the bladder wall.

Before the patient is placed in position, the gelatine, which has been previously sterilized, is immersed in a water bath and melted. For ordinary use in private practice or in a limited hospital service it is not necessary to have the elaborate apparatus here figured (Fig. III), but a small metallic ointment box is sufficient for all practical purposes.

The temperature of the water bath should be only sufficient to reduce the gelatine to the consistency of cold olive oil, as in this state it will adhere better to the balloon, which can be more easily rolled into the form of a suppository.

Before preparing the balloon for introduction into the bladder the hands should be disinfected. The bag is rolled between the thumb and forefingers in the same way as a hand-made cigarette. Into the concavity which naturally forms when the balloon is completely collapsed the gelatine is poured to overflowing, and the balloon slowly rolled, more gelatine being added until it assumes the form of a suppository well covered with the semi-fluid gelatine. It is now clasped with a long, slender crane's bill forceps, Fig. II, and inserted through the speculum into the bladder and released.

As the distension progresses the patient suffers considerable pain and an urgent desire to void her urine. By forewarning her of these attendant symptoms she will be able to withstand the pain, and the inflation can be carried up to the desired degree in 3 to 5 minutes.

The pain in chronic cystitis is usually severe during the first two or three applications, but the patient as a rule experiences so much relief subsequently that she is willing to persevere in the treatment.

A rectal suppository of 1 grain of opium, introduced immediately after the treatment, is of great service in alleviating the subsequent suffering. Having inflated the bag up to the required size, the clip on the rubber tube is closed, and the patient then assumes the dorsal or lateral posture.

Our rule is to leave the balloon in place for 15 or 20 minutes, beyond which time it does not appear safe, as the ureters are blocked while it is in place. In removing the balloon the clip is opened, when all but a small amount of air escapes; the rest is then aspirated with the air-pump, when the collapsed rubber bag is easily pulled out through the urethra.

We have treated at least ten cases with success in this apparatus. A history of one case of a severe type of chronic

cystitis of 13 months standing, well represents the efficiency of the vesical balloon.

CASE OF CHRONIC CYSTITIS.

M. J., admitted 10, 21, 95, colored, aged 35 years, married 10 years, no children, no miscarriage.

Complaint.—Frequent and painful micturition. Hematuria.

Menstrual History.—Menses appeared first at 16 years, always irregular, sometimes not occurring for two months. When she was about 27 years old she had a continuous fever for about one year, after this she only had a slight discharge every three months.

For the last 7 or 8 years the menstrual flow has ceased and there is no history of vicarious menstruation. She has suffered no inconvenience on this account, and says she is perfectly well with the exception of her present complaint.

Family History.—Mother living and well, two sisters died of phthisis.

Personal History.—Patient has always been " delicate," but has never had any prolonged spell of illness.

Present Ailment.—About thirteen months ago she began to have slight pain on urination, which grew rapidly worse, notwithstanding the remedies given by her physician. For the last five months blood has frequently appeared in the urine.

The frequency of urination is much greater at night, when she is often compelled to get up 8 to 10 times. She does not think the pain is increased by exertion, but says one week ago when coming to the hospital she had agonizing pain and several blood clots were passed.

There is a constant dull pain over the bladder, which becomes sharp and cutting during micturition. About the time the patient began to experience painful urination she noticed a yellowish vaginal discharge, which was probably of gonorrheal origin.

Present Condition.—Patient says she has lost considerable flesh since illness began. Defecation painful when bowels are constipated. Frequent and painful urination. When the paroxysms come on the patient has an expression of intense pain.

Examination of Bladder.—Urethra congested and reddened. The vesical trigone is intensely reddened, the rugæ stand out prominently, and over the surface of the bladder are flakes of pus and small blood clots. The area of intensest inflammation is in the inter-ureteric area and gradually shades off towards the fundus of the bladder.

In the areas of greatest inflammation the mucous membrane is of an angry red color and bleeds when touched lightly with the ureteral searcher. The capillaries are indistinguishable in the inflamed areas, and a careful search of the bladder fails to reveal the ureteral orifices. In the less congested areas above the trigone the capillaries are prominent, and at various points small, intensely red clumps or congeries of minute vessels are seen.

The anterior wall of the bladder in isolated places appears normal.

Treatment.—Application of ten per cent. ichthyol gelatine by means of vesical balloon. Patient experienced great pain at the time of application.

10, 22. Patient greatly relieved two hours after treatment, and still feels much better than before the treatment.

10, 23. Balloon again applied, still very painful; bladder appears less congested and the ureteral orifices are faintly visible. Marked improvement in symptoms; urination much less painful. Patient got up only three times last night. A colored drawing of the bladder by Mr. Brödel as it now appears is shown in Fig. IV.

11, 10. The bladder has been treated every third day since the last note was made, and now appears almost entirely well. The patient no longer experiences any pain between the treatments and thinks she is entirely well. Advised to remain one week longer.

11, 19. Patient discharged to-day. The mucous membrane has assumed a perfectly healthy hue, except a slightly increased reddening around the ureteral orifices. No treatment since the last note. The pain is entirely relieved, and the patient got up but once last night to urinate. A second colored drawing made by Mr. Brödel, Fig. IV, shows the present condition of the bladder.

THE STERILIZATION OF CATGUT BY CUMOL.*

By J. G. CLARK, M. D., *Resident Gynecologist*, AND G. B. MILLER, M. D., *Assistant Resident Gynecologist*, *The Johns Hopkins Hospital.*

Since the introduction of catgut as a practical suture and ligature material by Lister, many articles have been written for and against its use, and numerous methods of sterilization have been proposed. That many of these methods are unreliable is shown by the outbreaks of infection which have been traced either by direct bacteriological investigation or by the strongest circumstantial evidence to the catgut used in the cases.

Koch first called attention to the fact that commercial catgut as it is usually received from the manufacturer is rarely infected with pyogenic organisms, which accounts in a great measure for the absence of infection following the use of catgut prepared by the most questionable methods.

This observation has been largely lost sight of in the discussion of this subject, and many surgeons claim to obtain the most satisfactory results from the employment of catgut which is open to the gravest objections when considered from the bacteriological standard. At least three serious outbreaks of infection in surgical cases have been attributed to catgut. The first occurred in 1879 in the service of Zweifel, which was certainly traced by Koch to the suture material by a careful bacteriological study.

The urgent protest of Zweifel against the use of the Lister method of sterilization by carbolized oil caused many surgeons to abandon catgut.

Kocher, in 1881, after a very superficial study of the
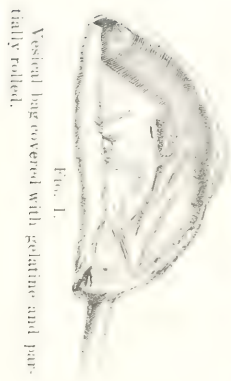
Fig. I.—Vesical bag covered with gelatine and partially rolled.
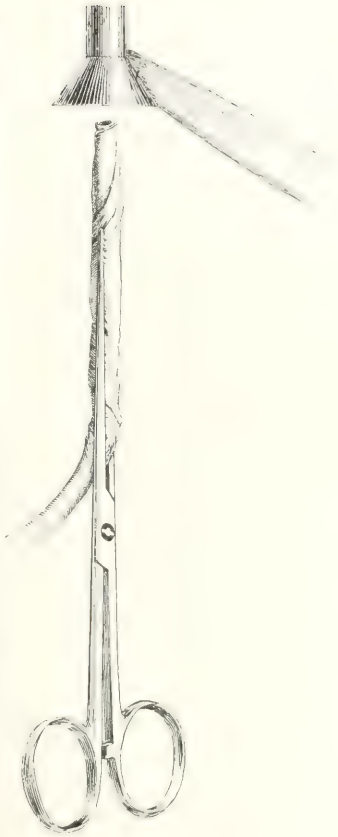
Fig. II.—Vesical bag rolled and clamped with slender forceps ready to be inserted into bladder.
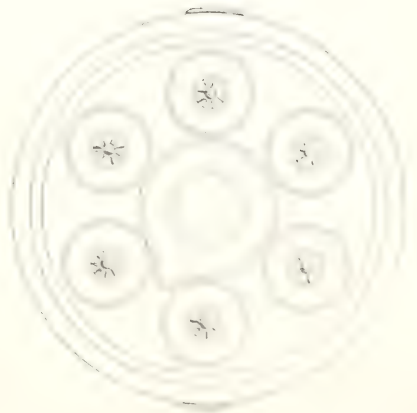
Fig. III.—Water-bath for medicated gelatine. Lower compartment filled with warm water to maintain gelatine in a fluid state. Before rolling vesical bag the gelatine is poured into glass receptacle in center of vessel.
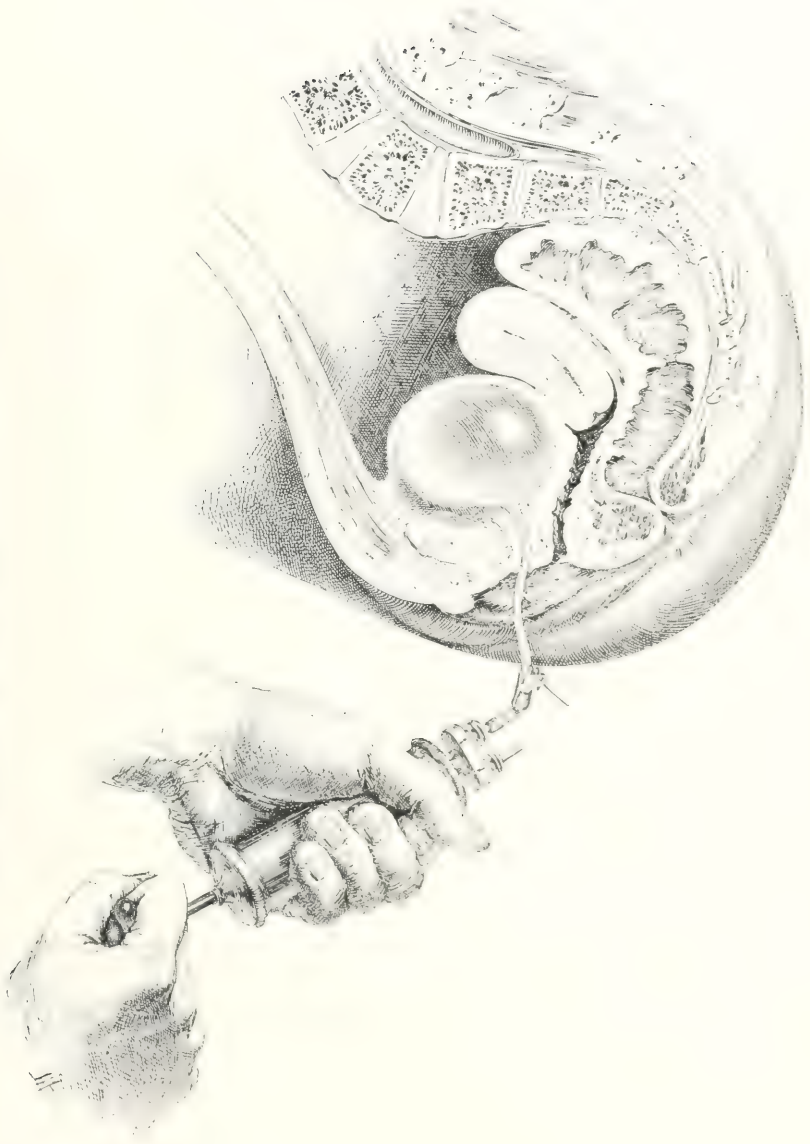
Fig. IV.—Patient in knee-breast posture, vesical bag inserted and inflated.

FIG. V.

FIG. VI.

Appearance of trigonum and a part of the posterior wall of the bladder before and after treatment.

germicidal power of juniper oil, introduced it as a sterilizing medium. Later, a large number of cases in his hospital service became infected, and Kocher, feeling that he had such strong evidence against the catgut employed in the cases, published an article against its use in any form, entitled "Fort mit dem Catgut!" (Away with catgut!).

In January, 1893, a very serious reign of infection occurred in the gynecological wards of the Johns Hopkins Hospital which Dr. Kelly believed to be due to catgut prepared by boiling in alcohol under pressure. Unfortunately the whole of the suspected catgut was used up in the last infected case, and consequently bacteriological proof similar to that obtained in Zweifel's cases was wanting. Dr. Kelly was so firmly convinced, however, of its rôle as an infecting agent that he, like Kocher, discarded all catgut, and for the two following years used silk entirely as a suture material.

Many chemical methods of sterilization have been proposed, but all are open to the objections of either failing to render the catgut innocuous, or impairing its tensile strength, or so impregnating the catgut with irritant chemicals that it acts as a local irritant when introduced into living tissue. The most perfect means of sterilization for surgical purposes is unquestionably heat. Until 1888, when Benckisser and Reverdin brought out independently of each other similar methods of sterilization by dry heat, it was considered impossible to raise any form of animal ligature to a temperature sufficient to render it sterile without making it brittle.

Reverdin demonstrated that it was not the oil as previously supposed, but the hygroscopic water in catgut, which caused it to become brittle when heated. If this is driven off by dry heat at a temperature of 70° C. it can be carried safely up to a temperature of 150° C. without impairing its integrity.

Reverdin and Benckisser both made careful bacteriological studies of these methods and found them to be efficient. The complicated apparatus, consisting of a hot-air oven and a thermo-regulator, however, prevented their general adoption.

The observations of these two investigators stimulated others in the right direction and caused them to look for a liquid of a sufficiently high boiling-point to sterilize catgut. Brunner found that the boiling-point of xylol was 136° to 140° C., and at once adopted it as a sterilizing medium.

This at last seemed to be the perfect method, but Krönig found spores occasionally present in catgut which were more resistant than the anthrax spores with which Brunner had experimented, requiring a greater temperature for their destruction than that attained by the boiling xylol. After a further search Krönig found that the boiling point of cumol, a hydrocarbon compound, ranged between 168° and 178° C., and substituted it for xylol.

After a careful review of Krönig's article,* Dr. Kelly decided to return to the use of catgut.

Krönig's method is as follows:

1. Roll the catgut in rings.

2. Dry it in a hot-air oven or over sand-bath for two hours at 70° C.

*Centralblatt für Gynaecologie, Juli 7, 1894.

3. Heat it in cumol to a temperature (165° C.) a little short of the boiling point, for one hour.

4. Transfer it to petroleum benzene for permanent preservation, or, if desirable, leave it in the benzene for three hours and transfer it to sterile Petri dishes.

A bacteriological study of this method by the writers shows that sterilization of catgut by the cumol is perfect, but that the transference from boiling cumol to benzene is open to serious objections.

BACTERIOLOGICAL STUDY.

The catgut used in the culture experiments was of the largest size (No. 3) used in the Gynecological Department of the hospital. Pieces were cut deeply in many places and immersed in bouillon cultures of the following bacteria: staphylococcus pyogenes aureus, streptococcus pyogenes, bacillus coli communis, bacillus anthracis, bacillus capsulatus (Welch), and bacillus subtilis. The cultures were, with one or two exceptions, 24 hours old at the time of the immersion of the catgut, a few being 4 days old. At the end of 4 to 5 days the pieces of catgut were taken out of the cultures of bouillon, which had been kept in the incubator in the meanwhile. These pieces were then dried in the hot-air oven at a temperature of 80° C. for one hour, and subjected to the cumol sterilization. After boiling for one hour in the cumol they were removed without abstracting the cumol remaining in them. They were placed upon agar either in Petri dishes or tubes, and these placed in the incubator. In every case the culture media upon which they had been placed remained sterile. Pieces of the infected catgut which had been dried but not sterilized were in like manner placed upon agar, as a control. In every instance these gave a growth of the micro-organisms with which they had been infected. In the experiments the staphylococcus pyogenes aureus, bacillus coli communis, bacillus anthracis, and bacillus subtilis were used each four times, the bacillus capsulatus once, and the streptococcus pyogenes once. The latter died either in the bouillon or in the drying process. The staphylococcus pyogenes aureus and bacillus coli communis were used on account of their common occurrence in cases of infection, and the bacillus anthracis and bacillus subtilis on account of the great resistance of their spores to the usual methods of sterilization.

Four experiments were made with the infected catgut to test the germicidal properties of benzene. The catgut was placed in the benzene and allowed to remain 24 hours, then removed and the benzene evaporated at room temperature. In each case the agar upon which this catgut had been placed showed a luxuriant growth of the micro-organism with which the catgut had been infected. The same micro-organisms were used here as in the other experiments except the streptococcus pyogenes and the bacillus capsulatus. A culture was made directly from the commercial benzene and two colonies grew upon the agar. Cover-glasses of these showed a large straight bacillus whose properties were not determined.

MODIFIED CUMOL METHOD.

From the above investigation we found that it was necessary to modify the method of Krönig so as to do away with the

use of benzene, as it is not a germicide and cannot be rendered sterile by heat without great danger. The following method was therefore adopted:

1. Cut the catgut into the desired lengths and roll 12 strands in a figure of eight form so that it may be slipped into a large test tube.

2. Bring the catgut gradually up to a temperature of 80° C., and hold it at this point one hour.

3. Place the catgut in cumol, which must not be above a temperature of 100° C., raise it to 165° C. and hold it at this point for one hour.

4. Pour off the cumol and either allow the heat of the sand-bath to dry the catgut or transfer it to a hot-air oven, at a temperature of 100° C., for two hours.

5. Transfer the rings with sterile forceps to test tubes previously sterilized as in the laboratory.

In making the catgut up into rolls it is only necessary to tie the ends in the isthmus of the figure of eight to hold them securely in proper shape.

If convenient it is better to use the hot-air oven for the drying process, but this is not absolutely essential, as a sand-bath can be improvised, as suggested by Krönig, to serve this purpose.

A beaker glass of at least a half-liter capacity is imbedded three-fourths of its height in a tin or agate-ware vessel of sufficient capacity to permit three-fourths of an inch of sand to be packed about the sides and beneath the glass.

In drying or boiling, the catgut should not come in contact with the bottom or sides of the vessel, but should be suspended on slender wire supports or placed upon cotton loosely packed in the bottom.

During the drying process the beaker glass is covered with a sheet of pasteboard, through which a centigrade thermometer is thrust so that the mercury bulb may be suspended about midway in the vessel. In this way the temperature can be regulated perfectly.

A Bunsen burner is placed under the sand-bath and the temperature in the beaker glass is slowly brought up to 80° C., where it is held for one hour, to dry the catgut. A higher temperature than 100° C., before the catgut is thoroughly dry, renders it brittle; this step in the method must be carried out most carefully.

When the drying process is completed the cumol is poured into the beaker glass and brought up to a temperature of 165° C., a little short of the boiling-point, with two Bunsen burners. A copper wire netting should be placed over the beaker glass to prevent the ignition of the cumol. This temperature is more than sufficient to kill all micro-organisms, and it is not necessary to allow the cumol to boil, which causes unnecessary evaporation (Krönig). The catgut is left for one hour at this temperature, when the cumol is poured off for subsequent use.

Cumol, which is of a clear limpid or slightly yellowish appearance when procured from the chemist, is changed to a brownish color by boiling.

The catgut is allowed to remain in the sand-bath until the excess of cumol is driven off and it appears entirely free from any oily matter. A period of one to two hours is usually sufficient to dry it thoroughly.

From the sand-bath or hot-air oven it is transferred with sterile forceps to sterile test tubes, such as are used for culture media, in which it is preserved from contamination until ready for use. Small quantities should be placed in each tube, to obviate the necessity of opening them too frequently.

In conclusion, it is well to bear in mind that while cumol is not explosive it is very inflammable, and great care should be observed in lifting the wire screen from the beaker glass to prevent drops of the cumol from falling in the flame or on the heated piece of metal on which the sand-bath rests, as it will take fire, flare up and ignite the fluid in the beaker glass. Such an accident has occurred three times in our experience.

PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS HOSPITAL MEDICAL SOCIETY.

The Treatment of Pyo-ureteritis and Pyonephrosis by Ureteral and Renal Catheters. Dr. H. A. Kelly.

I want to give this evening a brief resumé of some important work going on in the gynæcological department during the past year, namely, *the treatment of pyo-ureteritis and pyonephrosis by the renal catheter.* In the first place, a word or two as to diagnosis; by means of my cystoscopic apparatus, shown to this society in October, 1893, and the renal catheters first used in April, 1893, I have been able, in all cases with great facility and sometimes in a few minutes, to trace to its source the pus found in the urine of women.

Judging by the number of cases I have met with, pyuria in women appears to be common, and as a rule its source is utterly unknown to the practitioner in charge.

I have found pus in all parts of the urinary tract, from the external urethral orifice up to the kidney. In one case there

was an abscess in one of Skene's tubules at the orifice; in two other cases a suburethral abscess discharged into the urethra and filled the vesical speculum with pus as it was drawn out.

In another instance a contracted pelvic abscess opened into the bladder through the right broad ligament; by my cystoscope I could see the opening and run in a sound, and by pressure cause pus to ooze out.

In other cases I have been able to locate the affection in the urinary tract *above the bladder* by getting separated urines from both sides, and examining it bacteriologically and microscopically; a careful examination of the urea will determine the working coefficient of each kidney, a valuable point in the judgment as to the safety of operating.

I want to dwell now more particularly on the treatment of ureteral and renal pyuria by the renal catheter. There are two ways of treating accumulations of pus in the kidney by the renal catheter: *a)* by evacuation: *b)* by washing out.

a) The treatment actually begins with the first evacuation

when the pus is drawn off by the catheter, and may be continued either by leaving the catheter in the kidney for several hours (as in one of the first cases, where it was left in from 12.30 p. m. till late in the same evening), or for several days (from Wednesday morning until Sunday evening, in a case now in the house). By leaving the catheter in for a length of time I have been able to evacuate and drain an abscess, and then by introducing the catheter at intervals of one to five days I can keep it well drained. In several patients I have introduced it as often as once daily, in one woman over 120 times in all.

b) Washing out the kidney. In each case the kidney has been washed out after evacuating the pus, by a syringe connected to the catheter. I first used simple gravity for this purpose, by connecting the catheter with a funnel by means of a rubber tube. As the funnel was held high or lower, the fluid ran in or out (*v.* Johns Hopkins Hospital Bulletin, February, 1895).

I have used solutions of 1-150,000 bichloride of mercury and gradually increasing to 1-2500 and in one case even to 1-1000. In some instances I have used boric acid, and in one nitrate of silver. I find that the occasional use of the bichloride solution with the regular use of boric acid solutions gives good results.

Sometimes it only seems necessary to let the pus out to start an improvement. A case in point was that of Miss D., sent to me by Dr. Norment of Baltimore. She had an abscess in the pelvis of the kidney, and another just below the pelvis in the ureter. The lower pocket contained 45 cc. of pus. I evacuated these in my office, and she improved so much that she returned to work and abandoned further treatment.

The washing out may be repeated at intervals of 1 to 4 days, according to the condition of the patient and the way she stands it. This little procedure does not call for anæsthesia. The quantity injected is usually not more than two-thirds that of the fluid withdrawn. In one instance, in using the force-bottle of the aspirator, a quantity was accidentally forced in larger than that which came out, and the patient at once had a severe renal colic. Three women had ureteral chills and fever in the course of the treatment, with nausea and general malaise; there were two or three chills, and a sharp rise in temperature, highest on the second day, gradually subsiding and disappearing by the fourth or fifth day; the initial chill was more marked than the subsequent ones. The temperature went as high as 104 in one case and 103 in another, but no harm resulted, and treatment was continued.

The progress towards recovery is often as follows: After from five to ten catheterizations, the thick creamy pus begins to become watery and of low specific gravity, containing a small amount of urea (0.3 to 0.7 per cent.). Finally the pus disappears, leaving a hydronephrosis of lesser volume than the original pyonephrosis, and later the hydronephrosis too disappears and the condition becomes normal.

I will now briefly cite a few of my cases:

Case 1. Mrs. B had been in the Hospital about a year before for a suspensory operation. At that time she complained of frequent micturition. The urine was examined and the bladder inspected and found normal. She returned a year later, suffering extreme pain in the right loin, with high temperature, and wretchedly depressed. I put her in the knee-breast position, passed a catheter up the ureter into the kidney, but nothing came, as the pus was too thick to flow. I left the catheter in and sent her to the ward, where Doctor Clark attached the aspirator and drew out 280 cc. of thick, greenish pus, of fetid odor. Her kidney was then regularly washed out with bichloride and boric acid solutions, and the urine became clear. One time by mistake a 1-1000 solution was used; she suffered a good deal of pain, but made more improvement than after any previous treatment. She was finally discharged perfectly well after about 12 washings, with clear urine and without pain.

Case 2. Mrs. S. was brought here on a stretcher about four months ago, apparently in the last stages of illness and not far from death. I introduced the renal catheter, made suction on the end, and drew down a large amount of pus, and then washed her kidney out. The bladder specimen, examined at the time of admission, was reddish in color; thick white precipitate; acid; contained a trace of albumen.

Microscopic examination showed the entire field filled with pus cells. No tubercle bacilli found. Urea, one-half normal. Specimen of urine from right ureter, pale lemon color, with lower layer of gray thick sediment and an upper layer of sediment. Quantity too small for chemical examination. Field filled with pus cells. One hyaline cast. Amount of urea, one-fourth the amount of the mixed urine. Urine from left ureter: slight amount of albumen present; few leucocytes; few epithelial cells. Urea three times as much as from the diseased side. She has been washed out regularly, and the kidney, on entrance larger than a child's head, is now quite small; there is no more pus in the urine and she is well. She has gained 15 pounds.

Case 3, Mrs. S., a gonorrhœal stricture low down in the ureter, has been reported in the Bulletin (February, 1895) and will, therefore, not be reported in detail. Washed out over 120 times, with the result that from containing 150 cc. of pus, the kidney and ureter now contain 90–100 cc. of clear urine. I could not relieve the stricture entirely, and she still has a hydro-ureter.

Case 4, Miss S., was washed out over 100 times. Instead of getting better she got gradually worse. One day on applying suction to the end of the catheter I brought out a couple of black granules which proved to be masses of uric acid. I concluded upon this find that the inefficiency of the washing was due to a mechanical cause, a stone in the kidney, so I cut down and removed a small stone as big as the end of my thumb.

Case 5 was sent to me from Chicago for diagnosis (*v. Med. News,* Nov. 30, 1895). I was able to settle it by drawing out pus and urine through the catheter by suction, together with a number of little black specks and some granular debris; but the smaller specks were apparently of calculus. On withdrawing the catheter, a little calculus, black and mammillated on one side and buff-colored and jagged on the other, was found in its eye. The microscope showed that this was broken off from a larger stone. The end of the catheter also, instead of being smooth and round, was hammered down and angular and the side scraped off. This patient has not been operated on, but there can be no doubt about the correctness of the diagnosis.

Case 6, Miss F., is still in ward H under treatment.

The renal catheters used vary in diameter from 1½ to 3 mm., the average size used being 2–2½ mm. in diameter. If the pus will not flow through the catheter, suction will sometimes bring it.

A valuable plan where suction will not succeed is to inject some boric acid solution, say 15 or 20 cc., and then manipulate the kidney and mix the solution with the pus, and then let it run out with the diluted pus. In the case treated in this way last Wednesday I brought down a large beaker two-thirds full of pus so thick and curdy that you would have supposed it impossible to get it through the ureteral catheter used.

If you doubt whether the catheter actually reached the pelvis of the kidney, I have the following way of demonstrating that it actually was there. These catheters are pliable and easily molded by warmth, and after it has been some time in the kidney and ureter, on laying it on a cold surface as soon as it comes out it takes distinct curves and shows both the point at which it crossed the pelvic brim and the curve at the end where it impinged on the upper part of the pelvis of the kidney and bent over. One catheter taken out of a big abscess in this way gave a good idea of its size and form.

BACTERIOLOGICAL REPORT OF THESE CASES BY DR. G. B. MILLER, *Gynecological resident.*

Case 1.—Cultures made (March 30, 1895, and May —, 1895) from the pus obtained from the catheterized ureter, gave the micro-organism described more fully in Case 6. The length of the bacillus varied even more here than in that case, it being frequently 20–30 times the thickness. The pus was not examined microscopically at the time of its catheterization.

Case 2.—Numerous cover-glasses were stained for the bacillus tuberculosis at different times, and proved negative. No cultures were made.

Case 3.—The pus from the catheterized urine was repeatedly examined by Drs. Barker and Stokes. The former found "many diplococci, and these nearly altogether within the protoplasm of the leucocytes; a few within the squamous epithelial cells, and very few outside the cells." He believes "that if gonorrhœa can be diagnosed from pus that this is a case." Dr. Stokes found the same micro-organisms. No other bacteria were found.

Case 4.—The urine drawn from the right ureter was examined by Dr. Barker, who found that the pus when stained showed many bacilli within the protoplasm of the polynuclear leucocytes, also many bacilli in the urine, some being in chains.

Case 5.—No bacteria were reported as being found in the catheterized urine.

Case 6.—The pus from the catheterized ureter (Nov. 12, 1895) showed, when stained, a large coccus occurring singly and in pairs. These were not seen within the pus cells. Cultures from the pus upon glycerine agar proved negative.

Numerous cover-glasses of pus from the bladder were stained (Oct. 28, 1895) for the bacillus tuberculosis, but proved negative. The same pus stained by the ordinary methods showed bacteria in large quantities. Two forms of micro-organisms were made out: one, a coarse bacillus, straight or very slightly curved, with rounded ends; the other, a coccus

occurring in pairs and in short chains, and seen occasionally within the pus cells.

Cultures made from the bladder (Feb. 16, 1895) gave a white waxy growth on agar and glycerine agar raised above the surface and with irregular edges. The organisms did not produce gas with glucose agar, did not liquefy gelatine, but grew in a similar way as upon agar, coagulated and reddened litmus milk, and grew upon potato as a delicate, white, beaded growth. In form, the micro-organism was a coarse, slightly curved bacillus with rounded ends and 5–6 times as long as thick.

Note.—In Cases 1 and 6 the micro-organism does not correspond to any known pathogenie bacillus; whether it was the cause of the suppuration or was introduced into the bladder from the outside is not known, but it is probable that the latter was the case. The extension also from the bladder to the diseased kidney in Case 1 was possible.

HOSPITAL HISTORICAL CLUB.

Meeting of January 13, 1896.

Women in Medicine.—DR. KELLY.

Dr. Kelly spoke to the Society about Dr. Elizabeth Blackwell's recent book, *Pioneer Work in Opening the Medical Profession to Women.*

Dr. Blackwell is an Englishwoman, born in Bristol, England, in 1821. Her father was an active member of the Independent Church, and upon his removal to the United States in 1832 he became the friend of William Lloyd Garrison and entered zealously into the anti-slavery struggle. Three of his nine children have achieved distinction. Dr. Emily Blackwell was associated with her sister in the practice of surgery in New York, and Henry B. Blackwell, husband of Lucy Stone, has long been known for his untiring efforts in behalf of the enfranchisement of women.

The Blackwell family settled first in New York, but afterwards removed to Cincinnati, and it is here in the West, in the early forties, that Elizabeth Blackwell's struggles to obtain a medical education began. Her father had died insolvent, and the three elder daughters had to support the family by keeping a boarding-school for girls, so that in 1845, when the idea of becoming a physician first took shape in Miss Blackwell's mind, she was twenty-four years old and had yet to earn the money to pay for her medical tuition. She did this by teaching in the South, first in a forlorn Kentucky town and later in the Carolinas.

In 1847 she had saved enough money to begin, and went to Philadelphia, then the chief seat of medical learning in America, where her application for admission was refused in turn by the four medical colleges of that time. Her interviews with the various professors bring out some curious details which well illustrate the muddle of mind with which many intelligent men approach a subject so novel and so revolutionary as advanced education for women. Dr. Warrington, a well-known Quaker physician, and Dr. Pancoast, professor of surgery in the Jefferson Medical College, then the largest medical school in Philadelphia, both approved of a woman's

studying medicine, but they saw no better way for her to enter the medical classes than to disguise herself as a man. Trousseau gave Dr. Blackwell the same advice when she wanted to attend lectures at the École de Médecine in Paris.

The dean of one of the smaller schools, thinking of his pocketbook, frankly replied to the application, "You cannot expect us to furnish you with a stick to break our heads with." Professional rivalry is undoubtedly a serious obstacle to women in medicine, and keener for various reasons than the natural rivalry of man to man, but it is entertaining to read of a professor in a medical school who felt so sure of the rapid practical success of a woman physician that he actually proposed to enter into partnership with Dr. Blackwell, on condition of sharing profits over $5000 on her first year's practice.

Miss Blackwell's application for admission having been refused by the medical schools of both Philadelphia and New York, she procured a list of all the smaller schools in the Northern States, and quite at a venture applied to a round dozen of the best of them at once. The application was accepted by the medical college of Geneva, New York, and Dr. Blackwell was graduated from that institution in 1849, at the top of her class.

An interesting letter in Appendix I, from Dr. Stephen Smith, of New York, explains that the action of the Geneva Medical College in admitting Miss Blackwell was not originally meant to be serious. The faculty did not intend to admit her, but wished to escape direct responsibility by referring the question to the medical class, with the understanding that if a single student objected, out of a total of 150, the application would be refused.

"But," says Dr. Smith, "the whole affair assumed the most ludicrous aspect to the class, and the announcement was received with the most uproarious demonstrations of favor. A meeting was called for the evening, which was attended by every member. The resolution approving the admission of the lady was sustained by a number of the most extravagant speeches, which were enthusiastically cheered. The vote was finally taken, with what seemed to be one unanimous yell, 'Yea!' When the negative vote was called, a single voice was heard uttering a timid 'No.' The scene that followed passes description. A general rush was made for the corner of the room which emitted the voice, and the recalcitrant member was only too glad to acknowledge his error and record his vote with the class with evident disfavor, and returned an answer admitting the lady student. Two weeks or more elapsed, and as the lady student did not appear, the incident of her application was quite forgotten and the class continued in its riotous career. One morning, all unexpectedly, a lady entered the lecture-room with the professor; she was quite small of stature, plainly dressed, appeared diffident and retiring, but had a firm and determined expression of face. Her entrance into that Bedlam of confusion acted like magic upon every student. Each hurriedly sought his seat and the most absolute silence prevailed. For the first time a lecture was given without the slightest interruption, and every word could be heard as distinctly as it would be if there had been but a single person in the room. The sudden transformation of the class

from a band of lawless desperadoes to gentlemen, by the mere presence of a lady, proved to be permanent in its effects. A more orderly class of medical students was never seen than this, and it continued to be to the close of the term."

After graduation, Dr. Blackwell pursued her studies for several years in Europe,

in her experiences with medical authorities. At St. Thomas's Hospital, London, the surgeon to whom she was introduced thought it very indelicate for a lady to want to study in a hospital, and he simply acknowledged her letter of introduction by a line to one of his nurses, requesting that Dr. Blackwell would not visit any of the men's wards. At St. Bartholomew's Hospital it was the other half of humanity that was excluded from a woman's knowledge; through the courtesy of Sir James Paget she was made welcome to all the wards, "except the department for female diseases"!

Dr. Blackwell's account of her life as a *sage-femme* in the Maternité, Paris, is one of the most interesting chapters of the book. La Maternité was a great state institution, which received young women from every department of France to be trained as midwives. It occupied the old convent of Port Royal, and the discipline was monastic in its simplicity, regularity, and seclusion. The French authorities refused absolutely to make the slightest modification of their rules in favor of a foreigner and a graduate in medicine, and Dr. Blackwell was obliged to enter the Maternité upon the same conditions as the young ignorant French girls. The picture she gives us of the daily life of these French girls is charming. From seven to eight every morning, Madame Charrier, the *aide-sage-femme*, gave a stormy hour of instruction; later, after attending to the mothers and little ones in the wards, there came a second lecture from Dr. Dubois, "a little, bald, grey-haired man, with a clear, gentle voice and a very benevolent face." At 12 o'clock came dinner, followed by the sending up of a "prayer rocket," when the young girls crowded out of the hall, amidst laughing and talking, each carrying off for breakfast a loaf of bread under her arm and odd little pots of eatables in her hands. A pretty custom was class instruction in the old wood of Port Royal, preparatory lessons which the older *élèves* gave to the younger ones, seated on the grass under the shade of some fine tree. At night a favorite amusement in the *dortoir* was "to promenade the bedsteads"; the bedsteads were of iron on rollers so easily movable that an impulse given to the first bed would set a whole row going. Or perhaps a bedstead would be sent violently down the middle of the room, rolling over the old brick floor of the monks with a tremendous noise, and "accompanied by a regular Babel of laughter, shouting, and jokes of every description."

In the midst of all this the practical work of obstetrics went on, and these gay, ignorant girls were trained as midwives of every degree of efficiency and inefficiency. Elizabeth Blackwell's _____ _____ _____ _____ _____ _____ _____ _____ new side by side. A sad accident to Dr. Blackwell in the Maternité completely _____ her medical position. (It read on page 161, "I will mean to _____ it as _____ very _____ day the first lady surgeon in the world," and a little further on the

brave woman says simply that she had to abandon her intention of making surgery a specialty. She lost the sight of one eye at La Maternité, from an infection accidentally incurred while syringing the eye of a baby suffering from purulent ophthalmia.

In 1851, Dr. Blackwell established herself in New York, and began to practise under conditions that would have overcome a less courageous spirit. She had no medical countenance whatever, society was distrustful of the innovation, and patients came very slowly. Occasionally she received insolent letters, and unprincipled men spoke to her on the streets when she was called out after nightfall. She took a little orphan girl to live with her, to relieve the loneliness of her life, and an incident in connection with this child shows how severely Dr. Blackwell was let alone by the medical profession of New York. The little girl, who was accustomed to call her "Doctor," happened to be present one day during the visit of a friendly physician. After he was gone the child said, with a puzzled look on her face, "Doctor, how very odd it is to hear a *man* called 'doctor'!"

A passing note records gratefully that Dr. Sims was one of the first physicians to be cordial. He was at the time enlisting support for the foundation of the Woman's Hospital in New York. Dr. Blackwell writes: "He seems to be in favor of women studying medicine. I think I shall help him in any way I can." After a hard struggle for seven years, Dr. Blackwell, who had meanwhile been joined by her sister, Dr. Emily Blackwell, succeeded in establishing the New York Infirmary and College for Women, occupying the chair of hygiene in the college, while Dr. Emily Blackwell became chief surgeon to the infirmary. Dr. Blackwell returned to England in 1869, where she accepted the professorship of gynecology in the London School of Medicine for Women, established by Dr. Elizabeth Garrett Anderson.

It has been a long and useful life, and Dr. Blackwell's modest account of it forms a striking chapter in the history of medicine. She herself dates the end of her pioneer work in 1869, when successful medical colleges for women were in operation in Boston, New York, and Philadelphia, and when some of the older medical colleges for men had opened their doors to women. Just what advances have been made since 1849, when Dr. Blackwell was the only woman in the United States with a medical degree, may be seen by a reference to the Report of the Bureau of Education for 1893. It states that the total enrollment of students in all the medical colleges of the country, for 1892–3, was 28,900, of whom 1302 were women. This would give one woman physician for every twenty-two men. In Russia, which we are wont to think of as a semi-civilized community, the figures are one in twenty-eight. The advancement of women in medicine as in other lines of study and activity during the last twenty-five years has been enormous. No other movement forwards can compare with it in rapidity and force. It is simply another world to live in.

Dr. Blackwell's varied experiences have brought her in contact with many distinguished men and women, and she gives us pleasant glimpses as we read of some of them—Lamartine, Lady Byron, Florence Nightingale, Francis Newman, Charles Kingsley, and others. A letter from Lady Byron, very obscurely expressed, on the magnetoscope, suggests the radical incompatibility of mind between the poet and his wife.

A good story of George Jacob Holyoake is worth recording. At the Bristol Social Science Congress, in 1869, Herman Bicknell gave a "breakfast of all the religions." Holyoake coming in late from a meeting of Bristol workingmen, was greeted by his host with, "Now, Holyoake, pray let us have your famous demonstration of the non-existence of God." Mr. Holyoake thought for some minutes in profound silence, and then burst out, "Upon my word, Bicknell, I have really quite forgotten it."

NOTES ON NEW BOOKS.

Ueber das bacterienfeindliche Verhalten des Scheidensecretes Schwangerer. Von Dr. B. KRÖNIG. Deut. med. Woch., 1894, No. 43.

Menge and Krönig, of Professor Zweifel's clinic in Leipzig, dissatisfied with the discordant views regarding the mode of origin of infectious processes starting out from the genital tract, undertook a thorough bacteriological examination of the vaginal secretion. The labor was divided, Menge studying the secretion in non-pregnant women, Krönig that of women who were pregnant. The latter has given an epitome of his results in the article mentioned above.

Kaltenbach believed that external infection and auto-infection are essentially identical, the two kinds differing from one another only temporarily ; while external infection was caused by bacteria introduced during childbirth by the examining finger, auto-infection, on the other hand, was to be attributed to bacteria which during pregnancy or earlier had reached the genital canal and first showed their effects at childbirth or shortly afterwards. According to this idea it was taken for granted that bacteria find in the vaginal secretion a suitable nutrient medium in which they may live for months. This was the view also accepted by Steffeck and Winter.

Ahlfeld believes that every woman harbors in her vagina bacteria which, under suitable conditions, can give rise to fever and lead to the death of the individual. It is his opinion that in well conducted institutions the number of puerperal auto-infections is even greater than that of external infections. That puerperal fever is not universal was explained on the grounds of local predisposition, loss of virulence of the germs, etc. Mermann has even compared the vaginal secretion with the poison sac of a venomous serpent : "Just as a snake is uninjured by its own poison, so the secretion of a pregnant woman is harmless for herself."

Döderlein takes a more intermediate position. He distinguishes normal from pathological vaginal secretions and has spoken in full of their characteristics. Krönig does not believe that Döderlein's classification is justifiable. While there are certainly different kinds of secretion, distinguishable from one another by differences in bacterial flora, Döderlein's view that there is a special normal secretion in which his so-called vaginal bacillus alone is present, can no longer be held, since Krönig has shown the existence of many rods and cocci in secretions along with these vaginal bacilli. Very few of the bacteria which live in the vagina will grow aerobically on neutral or alkaline media. Part of them will grow on acid media, but the majority can be grown only anaerobically. K. has shown that these different forms are as harmless as the vaginal bacillus of Döderlein, and the cocci predominating in some of the secretions have, according to him, certainly nothing to do with the pathogenic staphylococci and streptococci. Döderlein asserted that he found in his so-called "pathological vaginal secretion" bacteria of very different kinds, among them pathogenic forms which would grow out on agar. Krönig's results do not agree with

this. His agar plates always remained sterile, no matter what forms were seen in cover-slips. Every kind of secretion which he met with was free from outside germs, both pathogenic and saprophytic. The doctrine of Kaltenbach that germs from the outside having once gained entrance to the vagina, can live there for months and find in it suitable conditions for growth and further development, is, Krönig says, untrue for any kind of vaginal secretion. Thus, while bacteria from the outside may in various ways be introduced in great numbers into the genital canal, the secretion remains absolutely free of aerobic bacteria if one waits for only a little time after the contamination, before making cultures. The vagina of a pregnant woman is capable either of mechanically removing outside bacteria after they have been introduced or of destroying them.

Krönig submitted the whole subject to bacteriological experiment, and studied the secretions of a large number of pregnant women. By means of sterile tubes, bacteria of different kinds were introduced into the vagina, and afterwards cultures were made at intervals, both from the entrance and from the interior of the vagina, the secretion being removed by means of Menge's vaginal spoon. In no one of the instances did any ill effects result.

In his early experiments he used the bacillus pyocyaneus. This bacterium was placed within the vagina of 20 pregnant women. The secretion in 9 of these had been found to contain vaginal bacilli; in 4 there were short bacilli of different kinds; in 7 cocci predominated. In the first group of cases all the pyocyaneus bacilli had vanished, on an average, after $14\frac{1}{2}$ hours; in the second group after 16 hours; in the third group after 20 hours. The results in the last group appear somewhat less favorable, but the differences lie within the limits of error.

As soon as Krönig had convinced himself of the protective power of the vaginal secretion against the bacillus pyocyaneus, he introduced staphylococci into the cavity under similar conditions and found that they were destroyed even more quickly than the bacilli. Afterwards he made three experiments with streptococci, using pregnant women at the seventh and eighth month. The streptococci were demonstrable for six hours only after introduction.

The results in 48 women can be summed up as follows:

1. No difference in the bactericidal activity of the vaginal secretion can be noticed between the cases in which bacilli predominate and those in which cocci predominate.

2. Considerable differences are met with in the rapidity with which certain bacterial kinds are destroyed by the vaginal secretion. Thus streptococci are killed most quickly, in about half the time required to destroy staphylococci or the pyocyaneus bacilli. The longest time required by the vagina to cleanse itself was about two days.

3. It can, therefore, be established, as a rule, that at the end of two or three days after the last introduction of anything from the outside the vagina of a pregnant woman will again be aseptic.

Upon what factors this natural immunity of the vagina depends does not seem perfectly clear. Krönig believes that several factors play a role, namely:

1. Chemical substances in the secretion, probably the acids.

2. The antagonism of bacteria living in the vagina to imported bacteria.

3. Phagocytosis.

4. Lack of oxygen.

He details his experiments bearing upon the relative value of these different factors.

Since the vaginal bacteria themselves are quite harmless, the only bacteria to be considered by the surgeon are those introduced from the outside. Having determined that the vagina can, as a rule, within a few hours and always at the end of two days complete the destruction of imported bacterial forms, Krönig determined to do some experiments in order to find out the influence of vaginal irrigation upon the length of time required to get rid of outside bacteria. He introduced bacteria in bouillon culture into

the vagina and after an hour irrigated with solution of Lysol, first without scrubbing the vaginal wall; in other cases the vaginal walls were thoroughly scrubbed in addition to the irrigation. He found that for 15 hours after this latter procedure the secretion is almost completely arrested, the walls are leathery, and it is even difficult to obtain enough secretion for the experiments. His results show that in the first place the irrigation does not markedly diminish the number of bacteria, and secondly, what is much more important, that thorough antiseptic irrigations impair the natural resisting powers of the vagina itself. He found in a series of cases inoculated with staphylococci and irrigated with Lysol that the foreign bacteria were not completely killed until after a length of time twice as long as when no irrigation at all was practiced. In a case inoculated with streptococci in which the vaginal secretion when left to itself was capable of destroying all the cocci at the end of 6 hours, with Lysol irrigations streptococci could be demonstrated for as long as 30 hours afterwards.

Krönig urges, therefore, the discontinuance of prophylactic irrigations of the vagina at childbirth. They do no good and probably do much harm. Even at the end of labor there should be no irrigation, and Krönig believes that even in those cases where gonorrhœal inflammation of the cervix exists, the results will be better if the surgeon trusts to the disinfectant power of the vagina itself.

Besides the laboratory evidence brought forward, Krönig states that he has clinical evidence in support of the views advanced by himself and Menge. At the Leipzig clinic in some 1500 births, including operative cases, no irrigation has been practiced, and the results, though not ideal, are essentially better than where irrigation was employed.

Krönig thinks that we are now justified in speaking of a true asepsis in obstetrical cases, since he has proved that pathogenic and saprogenic bacteria cannot live in the vaginal secretion of pregnant women. The most important point for the obstetrician to observe is the avoidance of the introduction *near the time of labor* of bacteria from the outside. A careless examination should never be made, since one can never predict exactly the time of onset of labor in any given case.   L. F. B.

Ueber ein bacterienfeindliches Verhalten der Scheidensecrete Nichtschwangerer. Von Dr. K. Menge, Assistent an der Universitätsfrauenklinik in Leipzig. Aus der Deutsche medicinische Wochenschrift, 1894, Nos. 45–48.

Dr. Menge sets out with the statement that the views concerning the bacteria found in the vagina vary greatly, a consequence of the conflicting results of the investigations undertaken to settle their character. Most of the therapeutic and preventive measures undertaken against gynecological and obstetrical inflammatory diseases of bacterial origin are dependent almost solely upon clinical experience, and a wider bacteriological research is necessary for the solution of the problem. He cites the conflicting views of von Leopold and von Ahlfeld upon the question of auto-infection. He says that it is well known and conclusively proved that the pyogenic bacteria have been found as the cause of puerperal infection and in infection following gynecological operations upon the vagina and uterus; also that the gonococcus exists in and causes certain pathological conditions of the female genital tract. The question then arises whether the pyogenic bacteria can exist in the vaginal tract as facultative saprophytes, and have an existence corresponding to the conditions under which we grow them outside of the human body. If the gonococcus gains entrance to a body surface which is intact, and which has a secretion that acts as a nutrient medium for the micro-organism, it will germinate and increase as soon as it arrives at the proper temperature. It can live only a short time as a saprophyte, but will either cause an inflammation of the underlying tissues or die. If the tissues are ——————————— organism can gain entrance, it will cause an inflammation which either gets well or becomes chronic. He consequently, from obser-

vation and experiment, lays down the following law : "The gono-coccus never lives in the human body through a long time if it uses the physiological secretion alone as a nutrient medium ; but its continued presence is due to an inflammation caused by it in the underlying tissues, from which it constantly reappears in the secre-tions of the parts." The term "gonorrhœal spontaneous infection" would therefore be correct only if the gonococcus could exist as a facultative saprophyte. The fever which occurs in the puerperium in these cases, which in part depends upon the extension of an already existing disease from one part of the genital tract to a larger one, cannot be called "spontaneous" infection, for it is the extension of a condition already existing. The name "auto-infec-tion" would, for the same reason, be incorrect for the fever caused by pyogenic micrococci existing in inflammatory processes going on in the vagina or cervix at labor and afterwards extending to the uterus or the entire body and causing a general infection. Natur-ally the question next arises : Can the pyogenic bacteria exist in chronic inflammatory processes occurring in the vagina and cervix at the puerperium, and in this way cause a general infection? He believes they cannot, because, first, they are not found in these con-ditions, or rarely so ; and, second, such processes do not correspond to the action of these bacteria in other parts of the body, for here they cause an acute inflammation which either gets well or leads to a general infection. It becomes next necessary to consider the question : Can the pyogenic bacteria exist in the genital tract as facultative saprophytes before labor? The investigations which have been made to settle this question have been dependent upon methods of research which consisted in examining the utero-vaginal canal by means of cultures and cover-glass preparations. Menge adopted a new method, i. e. he carried into the vaginal canal the pyogenic bacteria and studied their behavior there. He selected for his experiments women upon whom laparotomies had been per-formed, and in whom the cervix and vagina had not been included in the operation. As he found quite a difference in the bacteria of the vagina proper and the introitus vaginæ, he used a small spoon, by means of which he could secure the secretion from the vagina without coming in contact with the introitus. Before the intro-duction of the outside organisms in each case, he made cultures and cover-glass preparations from the vaginal secretion, and also from the introitus. Fifty cases were examined in this way. From the vagina 44 inoculated agar plates remained sterile, and 6 showed a growth ; from the introitus vaginæ 48 of the 50 showed growths. In only one case did he find a known pathogenic organism in the vagina, the streptococcus pyogenes. In three cases altogether he found the streptococcus pyogenes at the introitus. The reaction of the secretions was as follows :

	28 acid.	Introitus	34 acid.
Vagina	16 alkaline.		13 alkaline.
	6 amphoteric.		3 amphoteric.

Menge believes that the difference in the reaction is due to vari-ations in the cervical secretion and the secretions from Bartholin's glands. In the 6 cases in which cultures from the vagina grew, the reaction of 3 was acid, 2 alkaline, and 1 amphoteric. The facts brought out here show that Döderlein's belief that it is the vaginal bacillus alone by its acid production which keeps the vagina free from the pyogenic bacteria, is not correct. For 14 cases in whom the secretion showed an alkaline reaction gave no growth upon the agar, and of the 6 cases from the secretion of which micro-organisms did grow 3 were acid, 2 alkaline and 1 amphoteric, as stated above. The stained preparations showed numerous bacteria. None were free from cocci ; bacilli of various kinds were found also ; fine, slender, curved bacilli were in some, the vaginal bacillus of Döderlein in others, and in the largest number were seen short, thick, straight rods. Menge did not attempt to determine the characteristics, etc., of the bacteria found originally within the vagina, but contented himself with observing the fate of bacteria introduced from without. He found the cellular constit-

uents of the secretions to vary considerably ; in only a few cases were epithelial cells alone seen, but in the majority leucocytes were also found in varying proportions along with the epithelium.

He made altogether 80 experiments upon 35 women for the pur-pose of determining the fate of the pyogenic bacteria when intro-duced into the vagina. In order to change as little as possible the natural condition of the vaginæ he introduced the micro-organisms taken from plate cultures by means of a slender glass rod into the vaginæ and then spread them over the vaginal walls. The experi-ments were begun with the bacillus pyocyaneus, both on account of its color production and its low pathogenic properties ; and when he found that these bacteria invariably underwent destruction in the vagina, he continued his investigations with the staphylococcus pyogenes aureus and the streptococcus pyogenes. He also used a potato bacillus on account of the high resisting properties of its spores. The pyocyaneus was used 23 times, the staphylococcus pyogenes aureus 30 times, and the streptococcus pyogenes 27 times. In every case the vagina freed itself from the introduced bacteria, the average time necessary being 25 hours. At the introitus vaginæ the bacteria remained by several days a longer time than in the vagina proper. He followed the steps of the "self-cleaning" pro-cess by taking cultures and making stained preparations before the introduction of the bacteria, immediately after and following this at stated short intervals of time. He also tested the reaction of the secretion. These observations showed a destruction of the introduced bacteria beginning immediately and gradually continu-ing until the vagina regained its original condition. They also showed that immediately after the introduction of outside bacteria there was a marked tendency of the micro-organisms originally inhabiting the vagina to disappear, and as the bacteria introduced disappeared these gradually regained their original numbers. Along with this there was similarly an increase and a correspond-ing diminution in the number of leucocytes. Phagocytosis was also observed. Very unimportant or no changes occurred in the epithelial cells during the process. He, however, does not think the leucocytes play a very important rôle in the "self-cleaning" process, for some cases in which there was no leucocytosis showed the destruction of the pyogenic bacteria in the same effective way, and in these cases the secretion outside of the body under similar conditions destroyed the bacteria quite as surely.

The next factor considered was the want of oxygen in the vagina, but as the bacteria used were facultative aërobes, this was evidently not very important.

The next thing considered was lactic acid, which Döderlein claims was due to his vaginal bacillus, and to which he (Döderlein) attributed the self-purification of the vagina. That this was not all-important was proved by the self-cleansing power of those vaginæ which contained an alkaline secretion, and also by the power of the secretions, which, though acid, did not contain lactic acid. However, he experimented with solutions of this acid and found it an effective germicide, 0.5 per cent. solution killing strepto-cocci in 24 hours. In order to ascertain which factor in the secre-tion was of most importance he took equal quantities of a very acid vaginal secretion ; some of the samples were sterilized, others were tested in their natural condition. Both sorts were inoculated with bacteria. The unsterilized secretions destroyed the bacteria as before ; those which he sterilized lost this power to a large degree. Some of the same secretion which had been rendered alkaline still retained its germicidal power to a marked degree ; but upon sterilizing this alkaline secretion the inoculated micro-organisms flourished upon it as upon the ordinary nutrient media. These experiments proved that the most potent factor in the cleans-ing process had been destroyed by sterilization. This fact led him to think of the original bacteria of the vagina and their metabolic pro-ducts (Stoffwechselproducte), and also of the fluid from the underly-ing tissues. Some experiments made upon new-born children led him to consider the latter as a factor. These infants were still-born, and the bacteria were introduced in the same way as in his other

cases. The germicidal process began immediately after the introduction and continued until at the end of 50 hours, when the vaginæ were free from the outside micro-organisms. The vaginæ of the new-born when examined before the introduction of the bacteria were found to be of acid reaction, sterile, and containing as cellular elements only epithelial cells. The outside bacteria, *i. e.* the micro-organisms found in the vagina of the grown, only entered towards the end of the germicidal process and hence could have played only a small part in this process. Leucocytosis and phagocytosis were not constant. The absence of so many of the factors possibly concerned in the cleansing process of the vaginæ of adults caused him to think of the tissue juices (Gewebssaft) as one of the possible cleansing elements in the vaginæ of the new-born. He regards the factors of the germicidal process in these cases to be : first, acidity ; second, leucocytosis ; third, the growing in of the outside bacteria ; and, fourth, tissue fluid. He could not prove the latter owing to the impossibility of its separation from the metabolic products of the ingrowing bacteria.

As he reviews the ground over which he has gone he puts the factors as regards importance in the following order : 1. The normal bacterial flora of the vagina and their metabolic products, 2. acidity, 3. tissue fluid, 4. leucocytes, and finally, 5. the want of oxygen. The disturbance of one of these factors lessens the self-cleansing power of the vagina, and a sufficient disturbance or a loss of many of them allows the growth of the pyogenic micro-organisms. He says that there are certain conditions in the female sex in which a longer time than usual is required for this process of self-cleansing, and names them the vaginal secretion of the new-born, the vaginal secretion during menstruation, the vaginal secretion where there is a more profuse cervical or uterine secretion than normal, the increased vaginal secretion without increase in the uterine secretion, the vaginal secretion of women with relaxed vaginal outlets with descensus uteri, and the vaginal secretion of women who have passed the menopause. By comparing these, he thinks in most the reason is obvious, *i. e.* by an increased flow there is a decrease in the acidity and thinning of the vaginal secretion. The reason for the low degree of disinfectant power in the new-born has been previously stated ; its cause in the two last-mentioned conditions has not been satisfactorily settled.

Under what conditions then can pyogenic micro-organisms survive in the vagina ? He thinks this may be answered as follows : Under circumstances which to a large extent nullify the conditions previously stated, and then when large quantities of these bacteria are introduced. He illustrates this well by a case in which he found the streptococcus in the vagina. The woman had been infected also with the gonococcus, and when he examined her had a gonorrhœal cervical catarrh with an alkaline vaginal secretion. He tried to rid the vagina of the streptococci by various disinfecting solutions. With these he could kill most of the bacteria, but enough always remained to repopulate the vagina afresh. He then cured the cervical catarrh by applications of a zinc chloride solution, and now the vaginal secretion became acid and regained its normal consistency, and the cleansing factors of the vagina proved sufficient in a short time to kill the streptococci.

Menge has made experiments similar to those before mentioned, on a few girls who had not arrived at the age of puberty, and found the same prompt destruction of the introduced bacteria. The markedly acid secretion, the absence of any diluting discharge, and the thick, tenacious cervical secretion, he regards here as potent factors.

Finally he experimented upon 6 women upon whom "total extirpation" with amputation of the cervix had been done, and got the same results. Pyogenic bacteria introduced into the cervix in these cases were destroyed in 12 hours. These facts, alongside of the many culture experiments, etc., made upon the cervical and uterine canals, made him lay it down as a rule, "that the alkaline female genital tract, *i. e.* the cervix and uterus, is germ-free

excepting the gonococcus, and that spontaneous infection during birth is impossible."

I would say in confirmation of this law, that cultures have been made and cover-glasses examined from the uterine cavity in about 40 cases in this hospital within the past year, and in no case have any bacteria been found except the gonococcus.

Dr. Menge's work coupled with Krönig's upon pregnant women is of great importance, his experiments complete and his deductions logical. Some of the obvious lessons are : 1. In obstetrical cases there should be as little interference as possible, for the infection in a very large percentage of cases must come from the introduction of the micro-organisms from without ; 2. The good results in the gynecological operations upon the vagina and cervix are not so much due to the disinfection of the vagina, which is always incomplete, as to the cleansing power of the female genital tract ; 3. In "total extirpation," the futility of disinfecting the cervical canal ; 4. The important rôle which the gonococcus must play in inflammatory disease of the genital tract in nulliparous women ; and 5. The small percentage of instances of infection in vaginal hysterectomy and kindred operations may in this way be explained.

G. B. M.

BOOKS RECEIVED.

Diet in Sickness and in Health. By Mrs. Ernest Hart. With an introduction by Sir Henry Thompson, F. R. C. S., M. B., London. 8vo. 1895. 219 pages. W. B. Saunders, Phila.

The Johns Hopkins Hospital Reports. Vol. IV. 4to. 1895. 479 pages. Johns Hopkins Press, Baltimore.

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Twentieth Century Practice. An international encyclopedia of modern medical science by leading authorities of Europe and America. Edited by Thomas L. Stedman, M. D. In twenty volumes. 8vo. Vol. VI. Diseases of the respiratory organs. 1896. William Wood & Co., New York.

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Pregnancy, Labor and the Puerperal State. By E. H. Grandin, M. D., and G. W. Jarman, M. D. 1895. 8vo. 261 pages. The F. A. Davis Co., Philadelphia.

A Manual of Materia Medica and Therapeutics. By A. A. Stevens, Chapman, M. D. 2d ed. revised. 1896. 8vo. 254 pages. W. B. Saunders, Philadelphia.

Syphilis in the Middle Ages and in Modern Times. By Dr. F. Buret. Translated from the French, with notes, by A. H. Ohmann-Dumesnil, M. D. "Syphilis To-Day and among the Ancients." In three volumes. Vols. II and III. (No. 15 in the Physicians' and Students' Ready-Reference Series.) 1895. 12mo. 289 pages. The F. A. Davis Co., Philadelphia.

THE JOHNS HOPKINS HOSPITAL BULLETIN,
Volume VII.

The Bulletin will begin during the year 1896 its seventh volume.
As hitherto, it will contain reports of the work of the hospital and good work in the laboratories of pathology, physiology, etc.
The Bulletin continues to be the official organ of the Medical School.

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Report in Gynecology, I.

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The Results of Operations for the Cure of Cancer of the Breast, performed at the Johns Hopkins Hospital from June, 1889, to January, 1894. By W. S. HALSTED, M. D.

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BULLETIN

OF

THE JOHNS HOPKINS HOSPITAL.

CONTENTS.

ULCERATIVE ENDOCARDITIS DUE TO THE GONOCOCCUS; GONORRHŒAL SEPTICÆMIA.*

By William Sydney Thayer, M. D., *Associate in Medicine in the Johns Hopkins University;*
Resident Physician to the Johns Hopkins Hospital,
and George Blumer, M. D., *Assistant in Pathology in the Johns Hopkins University.*

Clinical observations of cardiac complications of gonorrhœa
are not new. Since the note of Brandes (Arch. Gén. de Méd.,
Par., 1854, XCIV, 257), a considerable number of cases of
so-called "gonorrhœal" endo- and pericarditis have been
reported. Lacassagne (Arch. Gén. de Méd., 1872, CXXIX, 15),
after discussing the literature and reporting a case of his own
where an acute pericarditis occurred in the course of a gonor-
rhœa, concludes that: 1. Gonorrhœa may be complicated
by inflammation of any serous membrane; 2. the particular
localization of the process, in such cases, is determined by the
predisposition of the individual; 3. the cardiac complications
are very rare; 4. the myocardium, perhaps, the endocardium,
sometimes, but particularly the pericardium, are attacked.

In the majority of the cases in literature where the direct
association of endo- or pericarditis with gonorrhœa has been
made out clinically, an arthritis has also existed. Morel (Des
complications cardiaques de la blennorrhagie, Thèse, Par.,
1878, No. 269), however, in his conclusions, asserts that
"rheumatism is not a necessary intermediary between the
specific lesions and those of the serous membranes, though the

coexistence of these two lesions is the usual condition." A
particularly interesting case of this nature, endo- and pericar-
ditis appearing on the fifth day after the beginning of the
urethral discharge, without coexisting arthritis, has recently
been reported by Prévost (Arch. Méd. Belges, 1895, 5).

With the recognition, however, of the fact that endo- and
pericarditis are occasional complications of gonorrhœa, the
true nature of these processes and their relation to the primary
lesion is far from being settled.

Since Neisser's description of the gonococcus, and more par-
ticularly since the demonstration of satisfactory methods of
culture by Bumm, in 1885 (Der Micro-organismus der Gon-
orrhöischen Schleimhauterkrankungen (Gonococcus Neisser),
Wiesbaden, 1885), and Wertheim, in 1892 (Die Ascendirende
Gonorrhoe beim Weibe, Leipzig, 1892), the various complica-
tions and sequelæ of gonorrhœa have been studied more intel-
ligently and with greater care.

To the more common complications of gonorrhœa, con-
junctivitis, cystitis, metritis, salpingitis, epididymitis, arthri-
tis and periarthritis, the occurrence of numerous other
complications has of recent years been recorded—peritonitis
(particularly in the female), pleurisy, local foci of suppura-

* *Vid.* Arch. de Méd. Expér., Paris, Nov., 1895.

tion, myocarditis, indeed general pyæmia, various cutaneous affections, iritis, neuritis, meningitis, meningo-myelitis, albuminuria, etc. But in these complications, as in the cases of the cardiac affections, the same question has existed with regard to the nature of the process.

Wertheim (*l. c.*) showed clearly that in the female direct infection (*per continuum*) of the uterus, tube, ovary and peritoneum might occur. The power of the gonococcus to cause suppuration is now undoubted. The ophthalmia is also clearly an infection by direct transmission of the virus. But if the entrance of the gonococci into the tubes and ovaries can be traced *per continuum*, and into the eyes by direct transmission, the same cannot be said of the iritis, which has been observed without a coincident conjunctivitis, nor of the commonly observed arthritis, nor of the various processes which have been observed in the nervous system. Indeed there are relatively few of the numerous complications above-mentioned which we can clearly trace to an extension *per continuum*, or, however much we may suspect it, to a direct transmission of the infective agent. Even in epididymitis, where until recently the extension *per continuum* has been generally accepted, the entire freedom from disease of the tracts connecting the urethra and epididymis has compelled us to seek another explanation.

Are these secondary processes truly gonorrhœal?' If so, what is their relation to the primary lesion?

As Finger (Arch. f. Derm. u. Syph., Wien u. Leipzig, 1894, XXVIII) well says, there are various possibilities in this connection:

"(*a*) The complication is produced by the gonococcus alone —*purely gonorrhœal*.

(*b*) The disease of the mucosa furnishes the opening through which the pyogenic cocci enter and give rise to the complication—*mixed infection*.

(*c*) The gonococcus produces the complication into which, however, the pus cocci enter later; both exist together until the gonococcus, dying, is succeeded by the pyogenic coccus—*secondary infection*.

(*d*) The complication is essentially not of a microbic nature; it is produced by the products of the growth of the gonococcus in the urethra and absorbed—of *toxic nature.*"

That secondary infections may exist in gonorrhœa has been clearly proven, and this fact has led certain observers to the extreme view that this was true in all instances—that the gonococcus was unable of itself to produce these secondary inflammatory processes. Later observations with improved methods have shown that this idea is erroneous.

In the arthritis, which is so common a complication of gonorrhœa, Petrone, in 1883 (Riv. Clinica, 1883, 94), found microscopically what he believed to be gonococci in an affected joint. This observation was followed by a number of others. The evidence, however, was suggestive, not positive, the identification depending only on the form of the bacteria. Deutschman, in 1890 (Graefe's Archiv f. Ophth., XXXVI, Abth. I, 109), went a step farther. In two cases of arthritis secondary to ophthalmia neonatorum he found, microscopically, the characteristic biscuit-shaped diplococci, which lay chiefly in the bodies of pus cells. *These cocci became decolor-*

ized when heated according to Gram's method, while cultures taken on the ordinary media proved negative.

Lindemann (Beiträge z. Augenheilkunde, 1892, I, H. V, 30) obtained, likewise, from a joint involved after ophthalmia neonatorum the characteristic diplococci, becoming decolorized on staining by Gram's method. He also believes that he succeeded in cultivating them (after Wertheim), though there were contaminations.

Höck (Wien. Klin. Woch. 1893, No. 41, 12th Oct., 736) finally succeeded in obtaining the gonococcus microscopically and in pure culture from a knee-joint in an infant with gonorrhœal ophthalmia. Neisser, in 1894 (Deutsch. Med. Woch. 1894, XX, 484) obtained gonococci microscopically and in pure culture from the ankle-joint and a finger-joint in an adult. And finally Bordone-Uffreduzzi (Proc. XI Internat. Med. Congr. and Deutsch. Med. Woch. 1894, XX, 484) not only obtained the organism in pure culture from an affected ankle-joint, but reproduced a typical gonorrhœa by inoculation from the second generation of these cultures, into the urethra of a healthy man who had never before suffered from urethritis. These cases go to show that in many instances the secondary processes in the joints are pure gonorrhœal infections, the gonococci reaching the joints, doubtless, through the circulation.

A case recently reported by Finger (*l. c.*) is of much interest. From an arthritis of the left knee-joint following on ophthalmia neonatorum he obtained gonococci microscopically and in pure culture during life. The child developed extensive phlegmon in the neck and mediastinum and died. At autopsy gonococci alone were found in an area of perichondritis about the cartilage of a rib; gonococci and streptococci in the knee-joint (*where, during life, gonococci alone were found*), and in the periarticular abscess of the left thigh; streptococci alone in the articulation of the left jaw and in the phlegmons of the neck and mediastinum. In patches of pneumonia pneumococci and streptococci were found. This case is particularly interesting in showing the possibility and manner of development of secondary mixed infections.

From a suppurative tendo-vaginitis (*m. tibialis anticus*) secondary to a gonorrhœa, Jacobi and Goldmann (Beitrag z. Klin. Chirurgie, 1894, XII, 827) obtained, in microscopical specimens of the pus, characteristic gonococci, decolorizing by Gram's method, while cultures on ordinary media proved negative; while more recently Bloodgood and Flexner obtained the organism in pure culture from a similar tendo-vaginitis (unpublished observation). Lang and Paltauf (Arch. f. Derm. u. Syph. 1893, 330) obtained the gonococcus in pure culture from an abscess on the finger coming on during an acute gonorrhœa. No connection could be made out between the abscess and the joint or the tendon sheath. Mazza (cf. Bordone-Uffreduzzi, *l. c.*) obtained the organism in pure culture from a suppurative pleurisy complicating a gonorrhœa. In this case there existed also an endo- and pericarditis. Wertheim (Deutsch. Med. Woch., Vereins Beil. No. 17, 1895, p. 118) has recently, in a case of cystitis, excised a piece of the mucous membrane of the bladder, where he found not only all the epithelial cells filled with gonococci, but also the subepithelial connective tissue, where capillaries entirely filled with

masses of gonococci were to be found. The patient had, at the same time, gonorrhœal joint affections. Kraków (Gaz. Lekarska, 1894, p. 632) reports a case of puerperal sepsis complicated with joint suppuration, and gonorrhœal ophthalmia and pemphigus bullosus in the new-born. Both in the vagina and in the pus from the joints gonococci were found. Finger (l. c.) is then apparently justified in his conclusions: "25. By entrance into the blood current, distributed by this, the gonococcus may be the cause of the most varied articular, periarticular, perichondritic metastases . . . " and " 26. Entering into the connective tissue, the gonococci may succeed in causing a genuine suppuration."

The proof, however, that many of these secondary suppurative processes are genuine gonorrhœal metastases is not enough to justify the assumption that all are of the same nature. The fever and constitutional symptoms, the albuminuria so commonly present, all point to a general intoxication, while the unsuccessful efforts to demonstrate bacteria in the lesions of the nervous system suggest strongly that these changes may be due to a soluble toxine. We must, probably, recognize in gonorrhœa a general disease, one which from a local starting point may cause severe general symptoms, fever, chills, albuminuria, while in other instances grave secondary local lesions may follow. In some instances, conjunctivitis, epididymitis, metritis, salpingitis, arthritis, synovitis, pleurisy, local suppurative processes, it has been definitely shown that the gonococcus itself may be the exciting cause, the coccus reaching the affected areas doubtless through the blood current; in other instances, neuritis, myelitis, cutaneous manifestations, iritis, the negative results of microscopical and cultural researches suggest that the local lesion may be due to a toxine alone.

As to the nature of the cardiac complications of gonorrhœa, little that is in any way positive has been contributed until a recent date. Martin (Rev. Méd. de la Suisse Romnade, 1872, 2, 308) reported a case of gonorrhœa, suppurative prostatitis, cystitis, ulcerative endocarditis, myocardial abscesses and metastatic abscesses in the kidneys. In the thrombi on the valves and in the suppurative foci he found, microscopically, two varieties of bacteria, one of which resembled, strongly, Neisser's gonococcus.

Gluzinski reported a case of ulcerative endocarditis with what morphologically resembled gonococci on the valves.

His (Deutsch. Med. Woch. XXIX, 1892, 993) found in the thrombi on a valve in a fatal case of ulcerative endocarditis following gonorrhœa, organisms resembling gonococci which decolorized when treated by Gram's method. Unfortunately, the heart had been hardened in Müller's fluid, so that the value of this test is doubtful.

Councilman (Tr. Assoc. Amer. Phys. 1893, VIII, 165) reported a case of gonorrhœa, suppurative prostatitis, arthritis, pericarditis with suppurative foci in the heart-muscle. He found the characteristic biscuit-shaped diplococci in the urethra, knee-joints, pericardium, and in the abscesses in the heart-muscle. These organisms decolorized entirely when treated according to Gram's method.

Winterberg (Festschr. z. 25 Jähr. Jub. d. Vereins Deutsch. Aerzte zu San Francisco, 1894, 8°, 40) found gonococci on the valves in a case of ulcerative endocarditis following gonorrhœa complicated with arthritis; they decolorized on treatment according to Gram.

These cases are certainly suggestive, especially the latter two, where the identification of the organism was more satisfactory. But the absence of culture experiments renders the results inconclusive.

Leyden's (Zeitschr. für Klin. Med., 1893) case goes a step farther. The case was one of ulcerative endocarditis following gonorrhœa, epididymitis, arthritis. Cultures on ordinary media, taken from a vein during life and from the left ventricle after death, were negative. On microscopical examination, however, after death, typical gonococci were found in the thrombus on the valve. These showed all the morphological and tinctorial characteristics of gonococci: 1. They were biscuit-shaped diplococci, never arranged in masses like staphylococci; 2. A good number of the diplococci lay in the characteristic manner within cells; 3. They lost their color when treated by Gram's method; 4. They were easily decolorized when treated with alcohol and oil of lavender.

The evidence here that the organisms present were gonococci is strong, and the absence of growths on culture experiments on ordinary media, from the blood during life and the left ventricle after death, forms certainly suggestive evidence that the gonococci were present in pure culture. The definite proof, however, of the existence of a gonorrhœal septicæmia as well as of an ulcerative endocarditis due to the gonococcus alone is, we believe, furnished in the following case:

CASE. L. S., widow, 34 years of age, entered the Johns Hopkins Hospital on April 25, 1895, complaining of weakness, cough and vague general pains.

Family History.—Father died of sunstroke. Mother is living and well. Is an only child. Her husband died of pulmonary tuberculosis.

Personal History.—Says that she had none of the ordinary diseases of childhood. No history of chorea, pneumonia, malarial or typhoid fever. Catamenia began at the age of 14 ; have always been regular. Was married at 24 ; has had five children ; two take average. Three months ago suffered from "rheumatism"; the pains were in the fingers, wrists, knees and shoulders ; they were apparently not severe ; would last only a few hours in one place, disappearing to return in another joint. She asserts that the joints were not swollen at the time ; was in bed ten days. Has had shortness of breath on exertion for three or four years. No history of œdema of the feet or legs.

Present Illness.—The patient dates her present illness to the time of the rheumatism, three months ago. Since this time she has never been strong. Three days ago she became weak [words illegible] weak and tired ; at this time she noticed a patch of herpes upon her lower lip. Since this time she has felt weak and exhausted ; vague pains in the back and limbs, drowsiness, thirst, anorexia ; no epistaxis or diarrhœa. Gave up her work two days ago. Yesterday morning had a distinct chill.

On entrance, April 25, 1895, the patient was an undernourished woman ; face flushed ; lips and mucous membranes a trifle cyanotic ; pulse 132, of small volume, regular in force and rhythm ; respiration 41, temperature [illegible]. Heart: the point of maximum impulse in the fourth and fifth spaces ; sounds best heard just inside the nipple line in the fourth space. The first sound was loud and rough, preceded by a presystolic murmur, and followed by a systolic murmur which was transmitted into the axilla. Hepatic dulness at fifth rib in the

mammillary line; border palpable about 3 cm. below the costal margin. Spleen, not distinctly palpable. Abdomen, negative; no rose spots.

The *blood* showed no malarial parasites, but a slight leucocytosis, 12,000 leucocytes per cu. mm.

26, 4, 95. *Urine.*—Reddish amber, acid, 1015, distinct trace of albumen, no sugar, abundant white flocculent sediment; microscopically, numerous pus and large epithelial cells; no casts seen. Distinct diazo-reaction.

At the morning visit the following note (Dr. Thayer) was made: "The patient passed a good night; the fever has diminished this morning. The thorax is symmetrical; costal angle narrow; expansion of the two sides equal. Auscultation and percussion clear throughout. Heart: point of maximum impulse is in the fifth space about in the mammillary line, 9¼ cm. from the median line; impulse strong and preceded apparently by a slight thrill. Relative dulness begins at the third rib, does not pass the left sternal border; passes obliquely out to the point of maximum impulse. The first sound is flapping and valvular and is preceded by a short vibratory murmur, presystolic in time, which disappears above the fourth rib; it is followed by a loud blowing systolic murmur which is lost as one reaches the mid-axilla, and is but feebly heard at the base. The second pulmonic sound is accentuated. Along the left sternal border the sounds have a peculiar sticky quality. The pharynx, uvula and fauces are injected. The spleen is easily palpable; dulness above begins at the fifth rib."

27, 4, 95. *Urine.*—Practically the same as on last note. Diazo-reaction present.

29, 4, 95. "The patient has had daily exacerbations of temperature, coming on at irregular intervals; yesterday there were two, one associated with a sharp chill. To-day the skin is moist; pupils dilated; pulse rapid. The heart's action is tumultuous. There is a distinct presystolic thrill to be felt at the point of maximum impulse. The systolic murmur is perhaps a little louder than on the first note. The right kidney is easily palpable, as is also the left, which can be easily felt below the spleen."

30, 4, 95. *Urine.*—Catheterized specimen; deep reddish amber, acid, 1014, trace of albumen, sediment white and flocculent; epithelial cells, no pus cells, no casts seen, no diazo.

30, 5, 95. This morning the skin is hot and dry; pulse twenty-six to the quarter, regular. The point of maximum impulse is in the fifth space, very sharply defined and preceded by a thrill. The presystolic murmur is not as intense as it has been, but the valvular flapping first sound is very intense and is followed by a slight but well-marked systolic whiff. The second pulmonic is accentuated."

Urine.—Same as on former notes. Diazo-reaction present.

4, 5, 95. "The spleen is very large, reaching more than six centimeters below the costal margin. Heart's action rapid, sounds much the same. Vaginal examination negative."

7, 5, 95. "This morning the patient is quiet; skin cold and moist; night-gown wet. Pulse regular, 29 to the quarter, volume small, tension rather low. There is visible pulsation in the fourth and fifth spaces just about the nipple. The point of maximum impulse is in the fifth space, eleven cm. from the median line. There is a slight presystolic thrill. Relative dulness begins at the third rib, does not pass the left sternal margin. At the point of maximum impulse is heard a short slight presystolic murmur, followed by a snapping valvular first sound and a loud blowing systolic murmur which is heard throughout the axilla. The presystolic murmur is heard only just about the point of maximum impulse; it is lost as one passes toward the base. The second pulmonic sound is sharply accentuated, while the second aortic is feeble. At the base the systolic murmur is not to be heard, but above the fourth rib there is a slight, sticky, grating sound heard after the first sound, very suggestive of a pericardial rub. This is particularly marked in the third left space close to the sternum. There is apparently a faint diastolic murmur heard along the left border of the sternum."

8, 5, 95. Examination of the blood negative for malarial organisms. Leucocytes 17,500 per cu. mm

9, 5, 95. *Urine.*—Normal, acid, 1008, trace of albumen, abundant sediment of pus and vaginal epithelium.

11, 5, 95. "The patient is much emaciated and very sallow. Tongue quite anæmic. The temperature yesterday was lower than it has been for several days, reaching only once 102°. The skin this morning is very hot and dry. Lungs: clear in fronts and axillæ; backs clear, excepting for a few fine moist râles at the bases. Heart: point of maximum impulse 13 cm. from the median line. Relative cardiac dulness reaches to the right sternal margin, beginning above at the third rib. The first sound at the point of maximum impulse is intensely sharp and valvular. The systolic murmur is short and scarcely to be heard in the mid-axilla, while the presystolic rolling murmur is well marked and echoing; it disappears, however, inside of the mammillary line and above the fourth rib. The second pulmonic sound is intensely accentuated. The first sound is reduplicated over the mid-sternum. The heart's action is very rapid, and the soft diastolic murmur, of which there was a suspicion at the last note, is not to be heard."

The patient began on the 7th to suffer from a slight diarrhœa, which increased steadily in severity; on the 11th there were eight movements. These consisted of a greenish watery fluid with small curds of milk: microscopically, granular debris, triple phosphate crystals, great numbers of bacteria. The fever and diarrhœa continued and the patient grew rapidly worse.

14, 5, 95. "The patient is much emaciated, dull, apathetic. The pulse at the time of the visit is slow, but of small volume and very low tension. The anæmia has become very marked. Heart sounds same as on last note."

Blood Count.—Red corpuscles, 1,840,000,
            Colorless   "   14,000,
            Hæmoglobin,   22 per cent.

Dried specimens stained with the Ehrlich triple stain show a moderate poikilocytosis; considerable difference in the size of the corpuscles; very few nucleated red corpuscles; marked leucocytosis. A differential count of 500 leucocytes showed:

Small mononuclear,	2.8 per cent.
Large mononuclear,	2.4 "
Transition forms,	0.4 "
Polynuclear leucocytes,	94.2 "
Eosinophils,	0.2 "

Urine.—Specimen obtained by catheter; clear, normal, 1009, acid, trace of albumen; sediment abundant, white; considerable numbers of pus cells, occasional casts with pus adherent; no tubercle bacilli; faint diazo-reaction.

16, 5, 95. "This morning the patient is very dull, feeble and apathetic. The diarrhœa grows steadily worse. Over the trunk and arms, and to a less extent over the thighs and legs, are a number of small pin-head petechial spots. The pulse, which has heretofore been regular at the time of the visit, is to-day bigeminal, the first of the two beats being the stronger; it is of small volume, very soft. Heart: point of maximum impulse is in the sixth space 15 cm. from the median line. Relative dulness begins at the second space and extends several cm. to the right of the sternum. To the left it passes obliquely outward to the point of maximum impulse. The heart's action, which was at first regularly bigeminal, becomes rapid and irregular after slight exertion, returning to the bigeminal rhythm again on rest. At the point of outermost impulse the first sound is snapping and resonant; it is followed by a systolic blowing murmur, which is heard throughout the axilla, and is preceded at the point of maximum impulse by a slight echoing sound which hardly deserves to be called a presystolic murmur. In the fourth and fifth spaces, however, just inside the mammillary line a thrill is to be felt and a presystolic murmur is well heard. A slight presystolic tremble may sometimes be heard in the mid-axilla. The second pulmonic is accentuated; the second aortic is feeble. Along

the left border of the sternum there is a slight soft diastolic murmur. In the lower right chest, in front and behind, are numerous fine moist râles ; elsewhere the respiration is clear."

Urine.—Specimen obtained by catheter ; slightly smoky, acid, 1011, marked trace of albumen ; sediment considerable ; much pus ; no casts seen ; red blood corpuscles ; diazo-reaction absent.

The patient failed rapidly and died about an hour and a half after the last note was made, at 11.20 a. m.

Autopsy, by Dr. Flexner, two hours after death.

(Abstract.) Anatomical diagnosis : Acute ulcerative endocarditis caused by the gonococcus. General infection with gonococci. Subacute tumor of the spleen ; infarction of the spleen. Infarction of lungs. Gumma of lung. Subacute nephritis. Chronic passive congestion of the viscera. Gonococci in the vagina and uterus.

Externally.—Body 163 cm. long ; well nourished ; still warm ; no rigor mortis. Slight livor mortis of the dependent parts. Small petechiæ in the skin of the trunk and thighs.

Internally.—Subcutaneous fat moderate in amount. Muscles dark red in color. *Peritoneum :* no excess of fluid ; both layers smooth. *Pericardium :* in the pericardial cavity, about 30 cc. of clear straw-colored fluid. Both layers of the pericardium smooth, with the exception of a few old fibrous patches over the right auricle.

Heart.—All the cavities of the heart, but especially the right auricle, are distended and contain fluid blood. The endocardium of the right side of the heart is smooth. The tricuspid valve is a little thickened along its free border, but it is not retracted. The pulmonary and aortic valves appear normal. To the mitral valve, affecting especially the aortic segment, thrombus masses are attached. Springing from the auricular surface of the valve, the ventricular surface being comparatively smooth, there are red granulations, and to the aortic segment a pedunculated mass is attached. This mass measures 3x2 centimeters and projects into the auricle. The vegetations are for the most part easily removed ; some are, however, more resistant. Where they were removed the surface of the valve was found eroded, the actual loss of substance being great enough to leave a distinct depression. The large thrombus is variegated, pink and grey in color, and is of different consistency in different parts. While quite soft in its interior it had not undergone puriform softening. Its surface is granular. It is firmly attached to the heart valve, which at the point of attachment appears to be thickened. The cardiac muscle is pale, softer than normal, and a little mottled. Coronary arteries delicate. The heart weighs 350 grams. Dimensions : length of left ventricle 8 cm. ; length of right ventricle 8 cm. ; thickness of left ventricle 13 mm. ; of right ventricle 4 mm. Aorta above valves measures 6.5 cm. Foramen ovale admits the tip of the little finger.

Lungs.—Old adhesions over right apex. On section, the lung has a salmon color ; its consistency is quite firm. In the lower left lobe is an hemorrhagic infarction measuring 1.5 cm. in diameter at the pleura. Several broncho-pneumonic areas are also present. In the lower portion of this lobe there is a grey, homogeneous and quite firm mass 1.5 cm. in diameter, sharply circumscribed and embedded in the lung substance.

Spleen.—Weight 780 grams. Dimensions 22x13x8 cm. The surface, excepting for a few flakes of fibrin at its upper end, is smooth. On the outer surface there is an infarction 2.5 cm. in diameter, over which the fibrin is present. The spleen is moderately firm in consistency ; pulp abundant ; malpighian bodies prominent.

Kidneys.—Combined weight 380 grams. Capsule slightly adherent, surface somewhat mottled by congestion and small ecchymoses. Cortex swollen and pale, striæ indistinct. Glomeruli difficult to see. A few hemorrhages into the mucous membrane of the pelvis.

Liver.—Weight 2030 grams ; cloudy swelling.

Stomach, intestines, bladder, rectum, pancreas, adrens show nothing remarkable.

Brain.—Not examined.

Uterus.—Not enlarged ; mucous membrane smooth ; covered by a thin opaque exudate. Vagina covered by a thin opaque exudate.

Frozen sections.—*Heart's muscle* shows extensive fatty degeneration.

Kidney : much swelling of the epithelium of the convoluted tubules. The glomeruli contain fat in small droplets. No fat on the tubular epithelium. There are small accumulations of round cells in the cortex between the tubules and in the neighborhood of the glomeruli.

Liver : moderate chronic passive congestion.

Microscopical examination of hardened specimens.—The cardiac valves show a condition of subacute endocarditis. The process consists in the infiltration of the valve substance with cells of various character and arrangement. The process is most acute at the surface of the valves and gradually becomes less acute as the depths are reached. On the surface, where the more acute process exists, the tissues are infiltrated with large numbers of polymorphonuclear leucocytes and a few small round cells. These leucocytes occur as a rule in masses, the nuclei being in places intact, in other places very extensively fragmented, the remnants of the nuclei staining poorly and the tissue between them consisting of a granular, fibrinous-looking material. From the base of this acute process there is a gradual shading off into a subacute one, the leucocytes decreasing in number and their place being taken at first by small round and spindle cells, deeper down by spindle cells only, so that at the base of the valve there is a well-formed but cellular connective tissue.

In places scattered through the areas of inflammation there are seen large cells filled with fine darkly staining granules. These at first sight might be taken for cells containing bacteria, but they are evidently "mastzellen." The surface of the valve is covered by a blood clot in which the corpuscular elements are still very distinct ; there is evidently an increase of the polymorphonuclear elements in the blood forming this clot. Capping the clot in many places is a layer of fine granular material presenting the appearance, offered at times in thrombi, of blood platelets. This material stains well in the eosin used as a counter-stain for the hæmatoxylin, and also retains at times the aniline colors used for demonstrating the bacteria. Diplococci are found scattered through the sections in small numbers, much smaller than would be expected from the appearances shown by the cover-slip from the valve. Their small number is evidently due to the facility with which they are decolorized, but a small portion of those present probably taking the stain.

These diplococci are usually oval and appear often to lie end to end, though in places pairs are seen with a well-marked biscuit arrangement. The diplococci are found in greatest number in the more acute areas, more especially in those areas where the fragmentation of the nuclei is most marked. At times the organisms lie outside of the cells, but at times they may be distinctly made out to be within polymorphonuclear leucocytes. One or two diplococci were seen in the blood clot, lying on the surface of the valves ; they seemed to be free in the blood and not in leucocytes.

The lung shows a condition of chronic interstitial pneumonia. The pleura is moderately thickened, and in places markedly so, large bands of connective tissue running from the surface into the depths of the lung substance. All through the lung the walls of the alveoli are much thickened, partly from engorgement of the vessels, but more particularly by an extensive formation of new connective tissue in the alveolar walls.

Many of the alveoli are somewhat dilated and empty ; many contain a slight exudate of granular material. Here and there a few polymorphonuclear leucocytes, and a few large cells containing dark brown pigment are seen in the alveoli. The larger vessels contain much blood, and there is a non-occluding thrombus in one of the larger branches of the pulmonary artery. Here and there through the lung substance are seen small growths of epithelioid cells.

The bronchi appear normal; they are free from exudate. The nodule which was situated in the lower lobe of the right lung consists of three zones: an outer zone composed of dense fibrous tissue, forming a capsule for the mass; a peripheral zone immediately beneath this, containing long epithelioid cells and a few round cells; and a central zone consisting of tissue which has undergone coagulation necrosis, containing fragments of many nuclei. A few large giant cells are seen in the peripheral zone of this area, as well as in that of a second much smaller area which is adjacent and which resembles the first in every respect. These areas are evidently gummata.

The *spleen* pulp contains much more blood than normal, the individual corpuscles being usually well preserved, causing partly, no doubt, the increased size of the organ. The polymorphonuclear leucocytes in the blood are evidently much increased in number, and there is also an increase in the small round cells of the pulp. The malpighian bodies show the greatest changes; they are uniformly enlarged, this enlargement being due to an increase in the number of the small round cells normally composing them. A lesion which is less uniform, but which is commonly found—in one section at least six were present—consists of small accumulations of cells in the substance of the malpighian bodies. These cells differ from the normal spleen elements in their larger size and more distinctly epithelioid form; they compose the larger part of these areas, which are distinctly focal in character; they are several times as large as the lymphoid cells, contain distinctly vesicular and usually oval nuclei, and are supplied with a relatively large amount of protoplasm. As well as these cells there are present in the foci a relatively increased number of polymorphonuclear leucocytes and a few nuclear fragments. In size, but not in structure, they resemble miliary tubercles. In the latter respect they are very like the focal lesions of diphtheria described by Oertel, etc.

In these areas a few very large cells with a good deal of protoplasm and very large vesicular budding nuclei, similar to the nuclei of bone-marrow cells, are seen.

The wedge-shaped area observed in the spleen macroscopically is seen to consist of two zones: an outer one consisting almost entirely of blood corpuscles, and an inner in which besides these elements a certain amount of necrotic spleen tissue is also to be seen. The arteries in the neighborhood of this infarction seem clear. One or two of the veins in the neighborhood, however, are seen to contain fairly fresh thrombi. In one place, in the immediate neighborhood of the infarction, a small area of necrosed spleen substance containing fragmented nuclei and a few polymorphonuclear leucocytes was observed.

The kidney shows a chronic interstitial nephritis of moderate grade, and evidences of a fresh process in the glomeruli. The capsule is not present in the sections. The subcortical layer is decreased and in places absent, the glomeruli here lying immediately beneath the surface. There is a moderate amount of connective tissue scattered through the kidney substance, more particularly in the cortex. There, at times, it assumes the form of a wedge-shaped mass of connective tissue, the base outwards, dipping down into the kidney substance. The greater increase in connective tissue is around the glomeruli, affecting the capsule of Bowman and adjacent tissues. The connective tissue just described is of the fibrous variety, but besides this there are a number of collections of small round cells of the lymphoid type, occurring mostly in the deeper layers of the cortex and usually having no connection with the glomeruli. Besides these changes there is a diffuse increase in the intertubular connective tissue. The glomeruli appear much more cellular than normal, and this is seen to be due to collections of cells within the capillaries, many of which on cross-section are entirely filled with cells. These cells are of two varieties: (1) oval cells of an epithelioid type with large vesicular nuclei and a moderate amount of protoplasm, and (2) polymorphonuclear leucocytes. In places the polymorphonuclear leucocytes

have escaped from the capillaries and are seen in the capsular space and in the tubes themselves at quite a distance from the glomeruli. The tubular epithelium is in places swollen and granular, the free edges of the cells ragged, while the lumina of the tubules contain much finely granular material. One or two hyaline casts were seen in the medulla.

Gonococci could not be demonstrated in any of the organs.

Bacteriological Examination.—In the cover-slip from the vegetations on the mitral valve there are numerous polymorphonuclear and a few large and small mononuclear leucocytes, besides a quantity of finely granular material. Between the cellular elements there are a very large number of bacteria, consisting of small oval cocci, occurring in pairs, side by side, and very often having a distinct biscuit shape, the opposing sides being concave. At times pseudo-chains of three or four elements are seen, and in a few instances the organisms have a tetrad arrangement. The polymorphonuclear leucocytes, almost without exception, contain diplococci; there may be only one or two pairs in the protoplasm, or the whole cell body may be replaced by a mass of diplococci. In quite a number of cases not only the protoplasm but also the nucleus has been invaded, and several pairs of cocci may be seen lying in the nucleus surrounded by a clear non-staining zone. No bacteria were seen in either the large or small mononuclear leucocytes.

These cocci presented the morphological features of gonococci. Cover-glass specimens stained with gentian violet, which readily stained the cocci, and then treated with Lugol's solution and alcohol (Gram's method), become completely decolorized; not an organism retains the stain.

Cover-glass specimens from the *vagina* and *uterus* show similar diplococci, decolorizing when treated by Gram's method.

Cover-slips from the infarction in the *spleen* are negative.

Cultures.—(1) During life:

4, 5, 95. Cultures from the blood were made by Sittman's method. The blood was drawn from the median basilic vein by a syringe which had been boiled for twenty minutes. The arm had been previously thoroughly scrubbed with soap and water and wrapped with a towel wet with a solution of bichloride of mercury, $\frac{1}{1000}$. About 2 cc. of blood was thoroughly mixed with a tube of agar-agar and plated. No growth resulted.

7, 5, 95. Cultures were taken again in the same manner. The mixture in the plates was at least one-third blood. After forty-eight hours in the thermostat the plates were crowded with white pin-head colonies. Cover-slips from these colonies showed a small oval diplococcus, at times biscuit-shaped, the elements lying side by side. Transplantations were made into agar-agar, gelatine, potato, litmus milk and bouillon. No growths resulted.

12, 5, 95. Cultures were again taken by the same method with the same result—an apparently pure culture of the same coccus. Similar colonies were found in the plates, and the same negative results were noted on attempts at transplantation.

(2) At the autopsy:

Cultures on agar-agar and bullock's blood serum from all sources —heart's blood, valves, liver, spleen, lungs, kidney—were wholly negative. But little of the heart's blood was transplanted. The laboratory was at this time out of the media necessary to grow the gonococcus.

The extraordinary resemblance of the organisms found in the vegetations on the mitral valve to the gonococcus and its characteristic reactions to staining reagents recalled immediately the negative results obtained on attempts to transplant the growths obtained during life. On re-examining these plates the colonies were found to consist of organisms exactly resembling those found in the thrombi on the valves. They showed the same staining reactions, decolorizing immediately when heated by Gram's method. Considering the large quantity of blood used, it may readily be seen that the medium was not materially different from that advised by Wertheim. The growths on this medium were abun-

dant, while transplantations on to ordinary media were without result.

Transplantations were again made, May 17th, on human serum and urine, bullock's serum, agar-agar and urine, foetus extract (Flexner) and agar, but the organism refused to grow. These media tested with living gonococci proved suitable. The conclusion is that by the sixth day the organism had died out.

Animal Experiment.—A mouse was inoculated into the root of the tail with a piece of the large thrombus the size of a hemp-seed. The result was negative.

These results, we believe, justify us in assuming that the organism present in pure culture in the circulating blood and on the affected valves was the gonococcus of Neisser.

(*a*) Its form and arrangement were characteristic.

(*b*) While present free, the cocci were frequently found crowded in the protoplasm of leucocytes in the thrombus on the valve.

(*c*) It refused to grow upon the ordinary media.

(*d*) It grew readily upon a mixture of human blood and agar-agar (one-third blood).

(*e*) It decolorized when heated by Gram's method.

The question of the point of entry arises, of course, immediately. Nothing definite was known of the manner of life of the patient before entry. The fact that cover-slips from the vagina and the interior of the uterus showed similar diplococci, decolorizing on treatment according to the method of Gram, leaves little doubt that the infection took place through the ordinary channels.

NOTE.—Since the writing of the above, two publications have appeared treating of cases of the same nature. In the first instance (Dauber und Borst, Deutsch. Arch. für klin. Med., Bd. 56, H. V and VI, 1896), cultures were obtained from the affected valve on blood serum agar, while transplantations and attempts to grow the organisms on the ordinary culture media failed. Though the morphology of the organisms was characteristic, while they decolorized when treated by Gram's method, yet owing to certain irregularities in the gross appearance of the colonies, the authors hesitate to assume that they were gonococci.

This conclusion is (properly, we believe) disputed by Michaelis (Zeitsch. für klin. Med. XXIX, H. V and VI, 1896, p. 556), who reports a characteristic case. The diplococci on the affected valves showed all morphological and tinctorial characteristics of gonococci, while cultures taken upon the ordinary media were negative.

One of the authors with Dr. Lazear has had occasion to observe, within the last month, a second typical case of ulcerative endocarditis associated with gonorrhœa where the gonococci were obtained from the circulating blood three times in pure culture, while at the autopsy (Dr. Flexner) growths were obtained upon human blood serum agar from the affected valves, from the heart's blood and from the pericardium (pericarditis). The case will be reported in full shortly.

POSTSCRIPT.—The attention of the authors has just been called to a review (by C. Fraenkel in the Hygienische Rundschau, 1896, No. 6) of a previous report of this case.

The reviewer states that "because during life, a gonor-rhœal affection was not discovered in the patient despite careful examination, (while) moreover, cultures of the micro-organism which was found were not made on human blood serum or Wertheim's serum agar, the case cannot be considered as an entirely unassailable (einwandsfreie) observation." We confess that we cannot see the justice of these objections. It is a well known fact among all gynæcologists that gonor-rhœal affections in the female may easily exist without being recognized by ordinary methods of examination during life. Examination of the vaginal secretion was not made in our case *during life*, but after death, in both vagina and uterus, characteristic organisms were found, diplococci of character-istic biscuit shape existing frequently within leucocytes, decolorizing when treated according to Gram's method. Furthermore, it would appear that the reviewer had failed to take into account the constitution of the medium upon which successful cultures were twice obtained during life. This medium consisted, as is stated above, of an intimate mixture of the blood drawn immediately from the median basilic vein with about a double quantity of melted agar, the mixture being immediately plated. Upon such a medium, practically that of Wertheim, the organisms were successfully cultivated. In the second case which has been mentioned above and will be reported later, cultures of the organism were obtained in the same manner during life, and, after death, upon human blood serum agar, while attempts to cultivate the organism upon all other media were without result. It may be added that the second case which occurred in a man was coincident with a gonorrhœa recognized during life.

W. S. T. AND G. B.

THE JOHNS HOPKINS HOSPITAL BULLETIN,
Volume VII.

NOTICE.

A NEW APPARATUS FOR IMMEDIATE AND PERMANENT DRAINAGE OF THE URINARY BLADDER AFTER SUPRAPUBIC CYSTOSTOMY.

By Jos. C. Bloodgood, M. D., *Resident Surgeon, Johns Hopkins Hospital; Assistant in Surgery, Johns Hopkins Medical School.*

(*Read before the Johns Hopkins Hospital Medical Society, November* 4th, 1895.)

The term cystostomy is used because a permanent opening is made into the bladder through the abdominal wall. By immediate drainage I mean that the tube is introduced at the operation and allowed to remain one or two weeks, at the end of which time it is removed and the sinus allowed to close—or in those cases in which the opening must be kept open, the apparatus for permanent drainage is introduced. In both cases the apparatus, to be described, consists of a tube attached to a rubber bag reservoir, the tubes only differing for immediate and permanent drainage.

Until one and one-half years ago the few cases of suprapubic cystostomy in which, for some reason, the sinus had been kept open, the patients have worn a hard rubber tube provided with a stopper, which was removed at frequent intervals to allow the bladder to empty itself. In all these cases there has been constant leakage, wetting both day and night clothes, and making it almost impossible for the patient to keep dry or free from the odor of urine. In those cases in which the bladder became irritable when distended, the stopper could not be used. The condition has been one of such discomfort to patients that surgeons only in very urgent cases resort to this method of drainage. The apparatus which I am about to describe provides such perfect drainage and the patients are so comfortable that I feel confident it will encourage the more frequent use of suprapubic cystostomy.

It has been perhaps because we have had few such cases that a better apparatus has not been improvised before. We were stimulated to improve our methods by the necessity of a case, that of a young and active business man, in which it was necessary to keep the bladder open for the local treatment of an early tuberculosis, and at the same time it was quite imperative that he should be able to continue his business with some comfort, and especially to be free from the odor of urine and the frequent change of dressings. With the intelligent co-operation of this patient this new apparatus was devised. He has worn the tube and bag for one and one-half years and has been able to conduct his business as usual. (I see him at the theatre now and then.) Since this first case five others have been provided with the apparatus. All are able to keep dry and free from the odor of urine, and to continue their ordinary life with comfort.

Encouraged by the success of the apparatus as permanent drainage in these cases, it occurred to me that it could be used with equal satisfaction for immediate drainage after operation. I devised and had made such an apparatus some four months before the opportunity offered itself for its use.

In July, 1895, suprapubic cystostomy was performed and this method of immediate drainage introduced. The patient, a man aged 63 years and quite feeble, was suffering from acute purulent cystitis. The prostate was only moderately enlarged.

There was dribbling of urine with retention. Catheterization was required to prevent over-distension. Catheterization followed by copious irrigation gave no relief and the manipulation was very painful. His daily temperature rose frequently to 103° and never fell below 101°; his pulse ranged between 110 and 130. The patient's relief after the operation was immediate and permanent; the tube was not removed for two weeks, since which time he has worn the apparatus for permanent drainage.

During the two weeks in which the apparatus for immediate drainage was used no urine leaked into the wound. The bag was emptied every three or fours hours, and twice daily the bladder was irrigated without a catheter through the tube into the bag. The patient after the third day was allowed to sit up in bed, and on the seventh day to get up in a chair.

Previous to this case the following method of drainage had been employed. A short rubber tube was introduced into the bladder and the suprapubic wound packed with gauze about the tube. The urine was collected in large pads of gauze placed on the abdomen. The care of these patients required a great deal of time; it was almost impossible to keep them dry. The drainage tube and gauze had to be changed on the fifth day, frequently sooner, and the re-introduction was painful. The gauze packing always became saturated with urine.

DESCRIPTION OF THE APPARATUS.

The rubber bag reservoir for both immediate and permanent drainage (see Fig. I) is 18x12 cm. in diameter, and holds about 350 cc. of urine. Patients usually empty the bag when about 250 cc. collects—every four or five hours. Sealed to the upper and central portion of the bag is a thicker piece of rubber with a small opening in its center, into which the head of the tube is inserted. The ends of the abdominal belt are also fastened to the center piece. The abdominal belt carries the entire weight of the bag (see photograph), so that there is no dragging on the tube. Two rubber tubes lead from the bag, the lower one being used to draw off the urine, and the upper to wash out the bag. Both are provided with stoppers.

After operation it is not necessary to change the position of the patient to empty the bag, and when the patient is up and dressed the bag can be emptied with no more than the usual unfastening of the clothes.

A longer tube could be attached to this shorter one and carried into a vessel beneath the bed, so that there would be continuous drainage. After operation there would be some danger of this tube being dragged upon, thus disturbing the suprapubic tube in the bladder. One of the six patients using this apparatus for permanent drainage employs this method
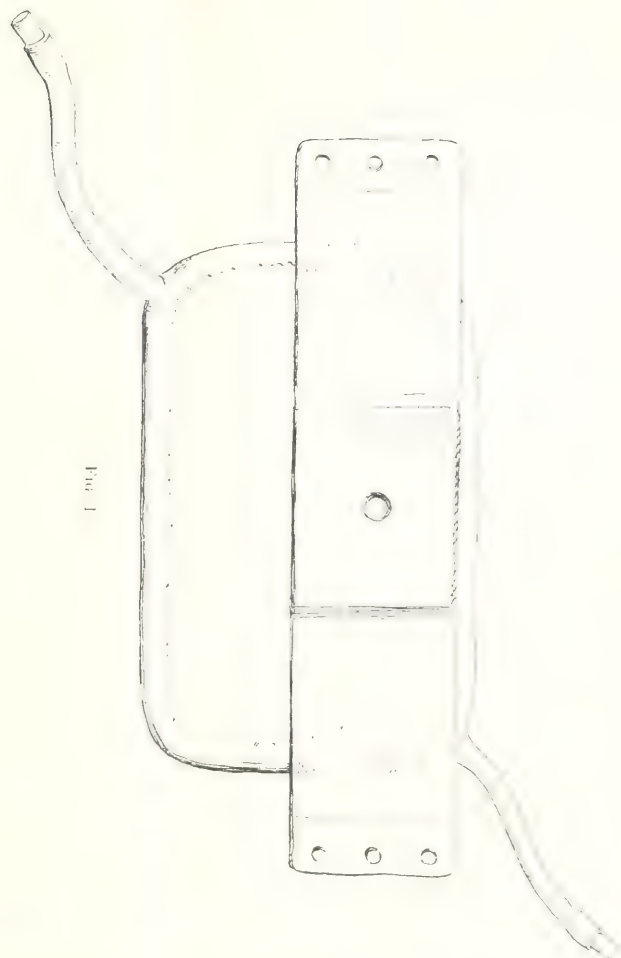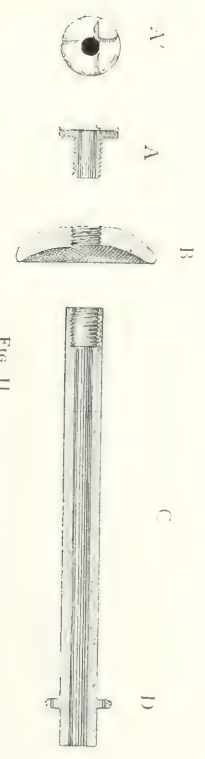
Fig. I.

Fig. II.

A'   A   B   C   D

Fig. IIIb.

Fig. IIIa.

Missile
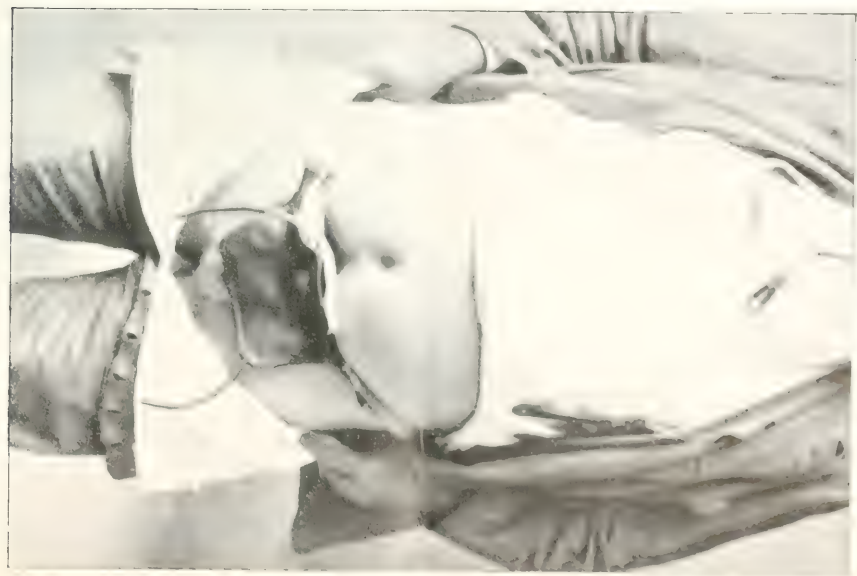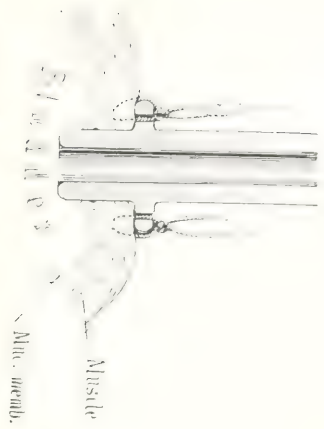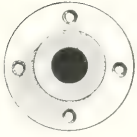
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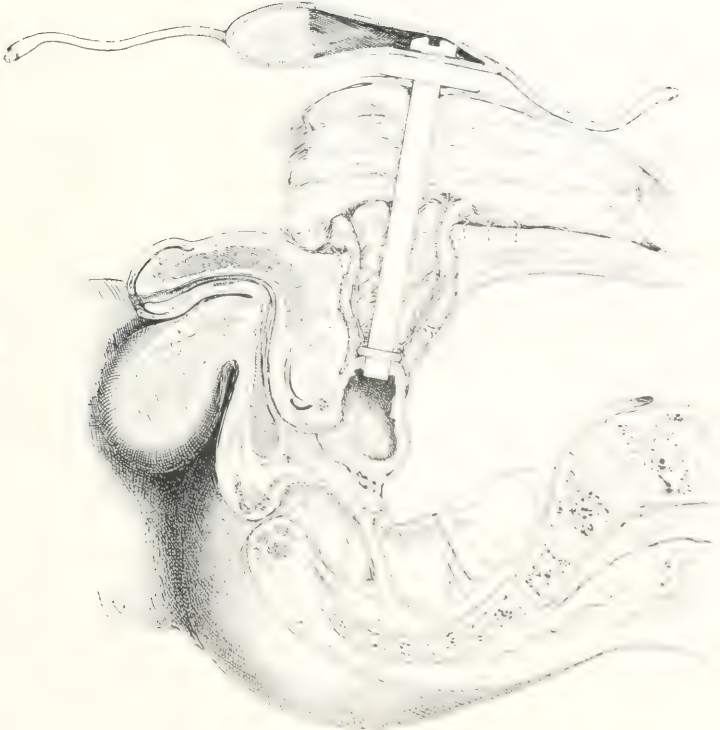
Fig. IV.

at night, and is relieved of the call to empty the bag every four or five hours.

The tube used for immediate drainage after operation (Fig. II) is made of hard rubber and consists of three pieces : *A*, shaped like a bolt, is 2 cm. long. Its head is 1.8 cm. in diameter and 3 mm. in thickness. The top of the head is grooved (*A'*) to allow free drainage into the bag. The head of the bolt is inserted into the hole of the bag, the elasticity of the rubber making a snug fit. (*B*), the second piece, which is saucer shaped, is screwed on the bolt, so that the rubber bag is held very tightly between the head of the bolt and this piece, and leakage is prevented. The straight portion (*C*) of the tube is 10 to 15 cm. long and 1.5 cm. in diameter ; 1.5 cm. from the bladder end is a shoulder (*D*) 5 mm. in width, pierced with four holes. This tube is first fixed into the bladder and then the bag armed with the bolt and second piece is screwed into the end of the tube.

The method of securing the tube in the bladder. – After opening the bladder, four silk sutures are passed through the wall, not including the mucous membrane, the inner piece of each suture being passed through the corresponding hole in the shoulder of the tube. The tube is inserted into the bladder and the sutures tied. The shoulder rests on the bladder wall, making a very snug fit, allowing no leakage (Fig. III). Gauze is packed down to the bladder about the tube, filling the suprapubic wound. The sutures are long and are carried out of the wound with the gauze. The object of the gauze is to absorb any leakage which during the first few days might take place. It may not be necessary, yet it is a safeguard against any infection by extravasated urine, and aids in holding the tube in place.

The abdominal wound is partly closed and gauze pads are placed about the projecting portion of the tube and held in place by a binder. On this cushion rests the bag reservoir— Fig. IV.

November 30th, Dr. Halsted kindly allowed me to use this apparatus on a second case. The drainage has been perfect (now two days). I have carefully examined all the gauze and find there is no leakage. There has been no pain or discomfort.

The tube for permanent drainage is not provided with a shoulder. It should be long enough to extend into the bladder at least 1 cm. The bladder end should be slightly bulbous. The tube should be curved or straight according to the direction of the sinus ; as a rule slightly curved. The second piece rests on the abdominal wall. It is smooth and produces no irritation. The abdominal belt holds the weight of the bag. The photograph shows the apparatus in position in a very fat man weighing 250 pounds. This patient has had a suprapubic sinus for three years, the urethra being closed by a very large prostate gland. He has had experience with both methods. This new apparatus he has worn eight months, and he tells me that he has been able to keep dry and free from the odor of urine ever since.

January, 1896. Since the note of November 30th, Dr. Halsted has used the apparatus for immediate drainage in two cases ; and these two cases, with the one operated on

November 30, are now wearing the apparatus for permanent drainage. Two of the operations were for stone in the bladder, and are wearing the apparatus until the cystitis improves sufficiently to allow the sinus to close ; the third operation was for carcinoma of the bladder.

In the last two cases a purse-string suture has been placed in the wall of the bladder about the tube in addition to the four sutures described.

In the first case (November 30) leakage took place on the sixth day, one suture having pulled out, but the sinus was already lined by fissure granulation, so that the tube for permanent drainage could be introduced, and in a few days the sinus contracted about the tube and no leakage took place. In the second and third cases, in which the additional purse-string suture was used, leakage did not take place until the eighth day, the suture having pulled out ; the tube for permanent drainage was then introduced, and in a few days no leakage took place.

Judging from these cases, we can feel certain that the apparatus for immediate drainage will work perfectly for eight days, and no doubt in some cases longer ; at this time, no leakage having taken place, the sinus leading into the bladder will be lined by firm granulations, the bladder will be fixed by adhesion, and the wound will be in an excellent condition for the introduction of the tube for permanent drainage. For two or three days, until the sinus contracts about the new tube, some little leakage will take place, but most of the urine will be collected in the rubber bag. The apparatus for permanent drainage should be changed morning and evening, and carefully cleaned. The bladder should be irrigated at the same time. As a rule, the bladder can be irrigated by introducing a glass nozzle 1 or 2 cm. into the urethra, the irrigation flowing out the suprapubic sinus. It is also a good plan to have the patient provide himself with two rubber bags, one for day and one for night use, so that each bag will be dry part of the time—the rubber will last longer.

The problem for immediate drainage after suprapubic cystostomy seems to be solved by this apparatus, for it provides perfect drainage, allowing no leakage, with a tube which can be removed without pain or difficulty, after which the wound will be in an excellent condition for the tube used for permanent drainage, which in turn leaves a sinus which will quickly close as soon as the introduction of the tube is discontinued.

In the last few weeks I have heard from most of the cases wearing the permanent apparatus, none of whom have any complaint.

In three cases of cholecystostomy, in which we did not wish the sinus to close, and from which the discharge was sufficient to annoy the patient by soaking the clothes, this same apparatus is worn with perfect comfort and no leakage.

HOSPITAL PLANS.

THE BACILLUS AEROGENES CAPSULATUS IN A CASE OF SUPPURATIVE PYELITIS.

By Herbert U. Williams, M. D., *Laboratory of Pathology, University of Buffalo.*

The increasing interest which the peculiar bacillus that is to be reported in this paper has recently awakened leads me to report a case of suppurative pyelitis in which this organism occurred, although not in pure culture.

During a short stay in Baltimore, at which time I was engaged in study in the Bacteriological Laboratory of the Johns Hopkins University, I was enabled, through the courtesy of Professor Welch, to study the gas bacillus, which had been first described by him in 1891. On my return to Buffalo I made an autopsy upon the body of a large man, 47 years of age, who had been dead 31 hours, and whose organs presented the peculiar appearances described by Welch and Nuttall, and which have generally been spoken of under the name of "schaumorgane." It is necessary to state that the autopsy took place in a private house, that the cadaver had not been placed on ice, but that the weather had been cold. A brief account of the autopsy record is as follows:

The subcutaneous fat was very abundant. The peritoneal cavity presented no extraordinary appearances. The lungs were bound to the chest wall by firm adhesions, and upon section they were dark in color and bloody fluid exuded from their cut surfaces. They were free from consolidation. The pericardium was obliterated, and beneath the epicardium over the left ventricle small hemorrhages existed. The heart was enlarged and of a spongy texture. The mitral valve showed slight thickening along its free edge; the other valves were delicate. The aorta was moderately atheromatous. The spleen was large and dark in color. The liver was not enlarged, but its capsule was irregularly thickened. Upon the section of this organ it was observed to be pervaded with small cavities up to 1 mm. in diameter, which gave to it a distinctly spongy appearance, and from which frothy fluid tinged with blood coloring matter escaped. The left kidney was enlarged. The capsule stripped off with ease, and upon incision into this kidney the fact was disclosed that the pelvis and calyces were dilated and filled with pus. Gas bubbles were not noted in this material. The right kidney was also enlarged and softened. As the urine had not been examined for many weeks, neither the physician in attendance nor the patient had suspected the condition found in the urinary tract.

The condition of the organs, particularly that of the liver, at once suggested the probability of the presence of some gas-forming micro-organism. The organs were removed to the laboratory and immediately examined bacteriologically. Cover-slip preparations were made from the parenchyma of the liver and the heart, as well as from the pus of the left kidney. In addition, dextrose-litmus agar tubes were inoculated from the same sources. The pus from the kidney exhibited in the stained smear preparations large, broad bacilli, the ends of which were for the most part rounded, and which could be seen at times to be surrounded with capsules. A small number of smaller and thinner bacilli, as well as oval coccus-shaped bodies, were also seen. The large bacilli which were the predominating organisms occurred as a rule singly.

The same micro-organisms in about the same proportion were found upon the cover-slip preparations prepared from the substance of the liver and the heart. The cultures were grown by Buchner's method at 36 degrees C. in the thermostat, and a rapid development with abundant gas formation took place. These showed upon microscopical examination a mixture of the several forms of bacteria already described, the oval cocci appearing now in the form of short chains.

Experiments on animals were undertaken about six weeks later, at which time a suspension derived from the culture made from the liver was inoculated into the ear vein of a rabbit. The animal was killed at the end of five minutes and kept in a warm place for 24 hours, at the end of which time it was greatly swollen. Gas was not demonstrated in the peritoneal cavity, although the right heart was blown up and gas bubbles were found in the blood-vessels and in the subcutaneous tissues. Cover-slip preparations showed the same large bacillus as had been present in the culture used for inoculation, and cultures from the viscera gave the same organism. About 1 cc. of the blood serum from the pleural cavity of this animal which contained the bacilli in considerable numbers, was injected into the muscles of the breast of a pigeon. At the end of five hours crepitation was present over the point of injection. The animal died on the third day. As the bacilli were not recovered from the seat of inoculation, the interpretation of this experiment is not clear.*

This bacillus agrees both morphologically and in its pathogenic effects with the organism originally described by Welch and Nuttall, and subsequently by Frankel and others. The occurrence of the bacillus aerogenes capsulatus as a widely diffused organism in nature is proven by the large series of cases in human beings which have been reported recently by

* Note by Dr. Flexner.—During a visit to Buffalo I was presented, through the kindness of Dr. Williams, with one of the original culture tubes prepared from the liver of this case. On returning to Baltimore I found that the organism, now some eight or ten weeks after the autopsy, was still alive, and I was able to complete the experiments left incomplete in Dr. Williams' study. The original culture still contained, along with the gas bacillus, both the thin bacilli and the streptococci which were present at the time of the autopsy. Their separation was effected by the inoculation of rabbits which were killed soon afterwards, and the preparation of cultures from the heart's blood of such a case. The bacilli obtained were short and thick, presenting rounded extremities; were single or combined into short chains and frequently capsulated. They grew readily at the temperature of the thermostat and produced abundant gas in sugar culture media. They furthermore were non-motile and slowly liquefied gelatine. They could be easily stained with Gram's method. Inoculated into pigeons and guinea-pigs, the characteristic lesions were produced, the animals succumbing in 24 to 48 hours. At the autopsy gas phlegmons had formed at the site of the inoculation; the tissues were dissected up extensively and were necrotic, and the bacilli were found in very large numbers in the local lesions. Gas formation in the tissues was detected as early as two hours following the inoculation, and it was present at the autopsy.

Welch and Flexner.* That this micro-organism can enter the body by way of the genito-urinary tract is made probable by this case, as well as by some others in the literature. In a recent report by Goebel of the case of a man 24 years of age, in whom at autopsy, in addition to a papilloma of the bladder, abscesses of the prostate gland and seminal vesicles and consecutive suppurative pyelo-nephritis existed, this micro-organism was obtained from the substance of the liver and heart in which many gas vesicles were contained. Associated with this bacillus were streptococci and the bacillus coli communis. It is not stated in this report whether or not the gas bacilli were present in the abscess formations. In a second case, this one being a man 66 years old in whom the prostate was enlarged, there was found at autopsy beneath the mucous membrane of the bladder, numerous gas bubbles, the largest of which measured 4 mm. in extent, from which a pure culture of the gas bacillus was obtained.

Among the cases reported by Welch and Flexner there are two of infection of the genital tract in which this micro-organism was found. The first occurred in a man 65 years of age who suffered from hypertrophy of the middle lobe of the prostate gland, cystitis, pyo-ureter and double pyelo-nephritis associated with multiple miliary abscesses in the kidney. The autopsy was conducted 14 hours after death. The pelvis of the left kidney was greatly dilated and contained a thick, greenish, somewhat blood-tinged pus and bubbles of gas. The mucous membrane of the pelvis showed a greenish discoloration, and gas bubbles were present in its substance. In the substance of the kidney as well as in the mucous membrane of the pelvis small abscesses occurred. The left ureter was dilated to the size of the index finger, and its mucous membrane presented a similar appearance to that of the pelvis of the kidney. The right kidney, excepting for the fact that it was even more enlarged than the left, presented the same appearance as the former. The bladder was dilated, its walls greatly thickened, the mucous membrane mottled and greenish in color. The enlarged middle lobe of the prostate projected into the bladder and offered an obstacle to the passage of the urine. It was as large as a horse-chestnut. Bacteriological examination of the kidney and bladder gave as the predominating organism a very coarse bacillus which agreed in morphology with bacillus aerogenes capsulatus, a smaller number of thinner, finer bacilli, and a few cocci. Cover-slips from the abscesses showed cocci only, which proved to be the staphylococcus pyogenes aureus. From the bladder and kidney, the gas bacillus, the bacillus coli communis and the streptococcus pyogenes were obtained. The second case was a man of 35 who had suffered from stricture of the urethra and cystitis. Perineal section had been performed. At the autopsy, which was made one hour after death, besides a chronic cystitis there were found double pyo-nephrosis and pyo-ureter associated with multiple miliary abscesses of the kidney. Both of the kidneys presented about the same appearances. On the surface there were many discrete and confluent abscesses. The pelves were much dilated and filled with thick, greenish-yellow pus. The mucous membrane itself was con-

gested and granular. Both ureters were greatly dilated and contained cloudy urine and flakes of purulent material. The bladder was contracted, its walls thickened, its mucous membrane congested and granular. The bacteriological examination of the kidney abscesses, the contents of the ureter, the bladder, and of the seat of the operation in the perineum, all showed the presence of the gas bacillus, the bacillus coli communis, streptococci and the staphylococcus aureus. In this last instance, although gas was not observed in the purulent contents either of the kidney or of the ureters, the short time which had elapsed between the death of the patient and the autopsy is to be remarked in view of the presence of the gas bacillus in the tissues. The part played by it in causing the lesions described cannot be determined in view of the other well known pathogenic species which were associated with it.

This small group of cases is of interest, it is considered, in connection with the question as to the existence of this organism in external nature and the various modes in which it may invade the animal body. It cannot be excluded, as has been pointed out by Welch and Flexner, that as it is often present in the intestinal canal, the gas bacillus was not brought to the kidney by the circulating blood, just as in other instances the colon group of organisms is transmitted to these parts. The finding of this particular organism in the external wound in the case of the perineal section would, however, indicate that it may have entered from without. It is not urged for the case which I have reported that the entire series of phenomena described are to be regarded as ante-mortem in their development, the length of time (31 hours) which had elapsed between the death of the individual and the autopsy examination and the fact that the body had not been kept on ice making it possible that the invasion had taken place post-mortem. It must be considered, in all events, that the rich development of the organisms in the viscera with the production of the appearance of "schaumorgane" was a post-mortem phenomenon, even though it be admitted that the kidney invasion had taken place during life.

JOURNALS, ETC., ISSUED BY THE JOHNS HOPKINS PRESS OF BALTIMORE.

* The Journal of Experimental Medicine, Vol. I, No. 1, page 5.

THE CHECKING OF OPERATIVE BLEEDING BY TORSION.*

By Edward Martin, M. D., *Clinical Professor of Genito-Urinary Surgery, University of Pennsylvania.*

In selecting the topic of my paper to-night it was not my intention to attempt a systematic consideration of the various means of controlling hemorrhage during operation, but rather to bring up for discussion one or two methods which, though not popular, have seemed to be serviceable under suitable circumstances; indeed, distinctly better than the procedures more commonly adopted. I particularly allude to manual pressure, proximal ligation, and torsion. But before taking up this my proper subject it may not be amiss to consider the effect which modern methods have exerted on operative and post-operative hemorrhage.

Within a few years, not more than ten, nearly every major operation was accompanied by such severe primary hemorrhage that marked systemic effects were produced—consecutive bleeding, that occurring within a few hours coincident with systemic reaction, was frequently observed—and secondary bleeding, occurring about the fifth or sixth day, was a common and often fatal complication. The abundant and continued bleeding during operation was due to the fact that forcipressure as it is now employed was not generally adopted, the vessels being seized and immediately ligated as rapidly as possible. Moreover, the use of the Esmarch bandage and tube was popular, and later many surgeons had faith in copious irrigations with hot or cold fluids, or failed to appreciate the effect of a slow bleeding continued through a long operation.

The frequent reactionary bleeding was practically a sequel of the severe primary hemorrhages, the patient being so depressed that comparatively large branches failed to bleed and were not secured. The increased blood pressure incident to reaction naturally led to hemorrhage into the wound.

The secondary hemorrhage was, of course, due to infection.

At the present day both consecutive and secondary hemorrhage are extremely rare, and save in exceptional cases but little blood is lost even in prolonged operations on vascular parts. The primary bleeding is avoided by proximal pressure where this is applicable, either instrumental or digital, the Esmarch tube when its use is indicated being applied with just sufficient pressure, and being kept in place for as brief a time as possible, the vessels are seized in forceps sufficiently strong to break the inner coat as soon as they are divided, or even before this if they are observed, the wound is kept dry, and if the operation is likely to be prolonged, attention is given to even the smallest vascular branches which by a slow, long-continued oozing might cause serious loss of blood. The effects of this slow but continued bleeding are well shown in bone operations—the removal of extensive sequestra, for instance. Such operations are generally followed by pronounced shock, due, not to the bone trauma, but to loss of blood, often not appreciated by the surgeon because it is so readily dried from the bone cavity by the assistant that it

makes little show provided the sponge is used rapidly and skilfully.

The crushing of the divided vessels by the forceps, the use of finer ligature material, the application of the ligature with greater care, more consistent effort being made to secure the artery, freed from the surrounding tissues, the avoidance of shock and the more careful application of dressings, all tend to prevent recurrent bleeding. I have seen but two instances of consecutive bleeding in the last eight years; one patient was suffering from splenic leukemia, the other from profound cholemia. Capillary bleeding was controlled only by pressure, recurring with its original severity for many days whenever the pressure was removed. I have seen but four cases of secondary hemorrhage in the same time, one a gunshot wound of the femoral artery and vein, in which I had employed lateral closure in the last-named vessel with the idea of lessening the danger of gangrene; the other three (seen within the last four months), cases of external perineal urethrotomy, bleeding occurring in one instance two weeks after the original operation. In all these cases the wounds were apparently clean. In the three urethral cases permanent catheters had been worn. Since the cause of secondary hemorrhage is commonly septic infection, the reason why this once ever-threatening complication of operations is no longer of importance in considering the question of prognosis is readily understood.

Considering now the bleeding which occurs during an operation, the first measures adopted by the surgeon are those designed to prevent the loss of blood immediately incident to the division of such vessels as lie in the line of incision required for the proposed operation. The preventive means usually employed is proximal pressure, applied by the rubber band, which under certain circumstances, as in shoulder or hip-joint amputations, must be kept from slipping by long transfixion pins or by bandage loops drawn upon by assistants. This method is efficient, is simple, requires no especial skill in its application, and is usually followed by no bad results. I believe that under certain circumstances manual pressure is equally efficient and is safer and simpler. In amputations and other major operations involving the extremities of infants and children under twelve, the grasp of the hand is usually sufficient to check bleeding, nor need this grasp be very firm. The hand, or two hands, of an assistant encircle the limb a convenient distance above the seat of operation, and firmly close upon it until the distal pulsation disappears. The amputation or excision is then conducted in the ordinary manner, and the vessels which can be found are seized. By a momentary relaxation of the grasp, arterial branches which are still patulous can be made to bleed for a moment and thus can be recognized and secured. It can readily be seen that by this method the tissues are not bruised, the effect of severe and continued pressure on the vaso-motors is wanting, and relaxation and tension may be made almost instantaneously, so that the minimal amount of blood is lost. In even the muscular adult this method of controlling hemorrhage is

applicable to operations upon the foot or the hand. In the emaciated adult—and such an one belongs to the class whom we particularly wish to protect from all unnecessary trauma—amputations of the thigh or upper arm may be thus successfully and bloodlessly accomplished. By manual pressure somewhat differently applied as required by the different conformation of the parts, the free bleeding which occurs in operations requiring division of the scalp readily may be controlled. In this case the ulnar edge of the hand is pressed firmly to the side of the incision from which the vascular supply is derived, and is made to press and retract as strongly as possible. Should a flap be raised, drawing this back sharply upon its pedicle will angle the vessels of supply sufficiently to check bleeding.

Digital pressure as a means of preventing hemostasis is particularly applicable to the common carotid artery and the abdominal aorta. Both these vessels are large, supply parts which are exceedingly vascular and which are subject to affections requiring extensive and difficult operations. The carotid is readily found and can be efficiently occluded by backward pressure against the transverse process of the sixth cervical vertebra. Pressure on one or both of these vessels would be indicated in certain operations upon vascular growths involving the bones or cavities of the face or cranium. In thin subjects the abdominal aorta can be distinctly outlined and can be efficiently compressed through the abdominal parietes, or through an abdominal incision the fingers could be applied directly to the artery. Such a procedure would be of great service in operation upon large malignant growths, such, for instance, as those which involve the pelvic bones. Digital pressure applied to the peripheral vessels often efficiently supplants the tourniquet. Thus I have been enabled to operate successfully on a large dissecting aneurism of the upper third of the femoral artery, employing as a preventive hemostatic only the thumb of an assistant placed on the artery as it passes over the brim of the pelvis.

Preliminary ligation is a method of hemostasis requiring an operation in itself, thus lengthening and complicating the necessary surgical intervention, yet successfully employed and strongly recommended under proper conditions by the few surgeons who advocate this measure. I have no personal experience with this method. It would seem serviceable, and many times has been satisfactorily employed in excision of the superior maxilla, the external carotid being secured, excision of malignant degenerations of the tongue, the lingual being tied, excision of the arm and scapula for sarcoma, the subclavian being secured, and amputation at the hip-joint, the femoral being secured. In all these cases the vessel of supply is readily and quickly secured, and the application of a ligature to it would very slightly lengthen the time of operation.

Though checking of hemorrhage by means of torsion seems to have been known to Galen, Amussat (Archive Générale de Médecine, tome XX, p. 608, 1829) deserves the credit of having proposed, practiced and popularized this procedure. He observed that there is little or no bleeding when limbs are wrenched off or when vessels are torn. He experimented on animals, tearing, rupturing and contusing the blood-vessels, but without satisfactorily checking hemorrhage. By chance he happened on one occasion to twist an artery which he had just cut, and observed that the spirals thus formed had no tendency to become effaced and that the flow of blood was checked. Repeated experiments convinced him that the method was safe and applicable in surgery. His experiments were performed upon dogs and horses. The femoral, carotid, internal iliac, thoracic and abdominal aorta were twisted in the following manner: the divided artery was seized in a pair of forceps, drawn out for half an inch, separated from the surrounding connective tissue by a second pair of forceps, and seized by the latter or by the fingers to prevent the twists from extending too far. The distal forceps was then twisted until the artery lying between the grasp of the two instruments was entirely broken through. The results of operations upon the dog were not entirely satisfactory, since the blood-vessels of this animal are extremely retractile and the blood readily coagulates. The horse was therefore considered a better animal for experimentation. In every case hemorrhage was satisfactorily checked.

Thierry (de la Torsion des Artères, Paris, 1829), in an elaborate paper on this subject, held that any form of forceps might be employed, provided they had a catch which held them closed, and provided their width was equal to the diameter of the artery to be twisted. He objected to separation of the artery from surrounding parts and drawing of it out from the wound, holding that the twists would extend too far, thus rendering them less permanent. He twisted small arteries four times, the ones of medium size six times, the large ones ten times. He did not fix the arteries before twisting them either with the forceps or fingers, nor did he consider it necessary to twist to the point of breaking the inner coats of the vessel, holding that the spirals of the twist were permanent and sufficient to arrest bleeding.

In criticising this method Petit called attention to the fact that the twists do extend far beyond the limits of the wound, that the nervous and cellular attachments of the vessel are torn, that there is a greatly increased amount of inflammation, and that the attachments of small vessels coming off from the artery which is twisted may be readily ruptured. Indeed Petit states he has seen this done in experiments on animals.

Schräder (translated by Petit, de la Torsion des Artères, Paris, 1834), from cadaveric examination, found that if the artery be exposed for a few lines of extent, seized, drawn out and twisted, the twists do not extend beyond the surface of the wound, this being prevented by the adhesion of the artery to the surrounding parts. The fibrous coats form a valve which so completely closes the vessel that its resistance cannot be overcome by pressure of liquid driven in with great force. In the centre of this external valve there is elevated a little projection exhibiting spiral markings formed by the debris of the broken tissues. A few lines below the position of this external valve the middle and internal coats are broken and torn circularly. They roll upon themselves, closing the artery lumen, the outer coatings of the middle tunics becoming apposed. The valve thus formed much resembles the semilunar valves of the aorta, since pressure within the vessel tends to close them more tightly. At the same time there is produced a clot within the vessel, though

this is not always formed. The effects of torsion are thus summarized: the inner and middle coats of the artery are torn circularly and become approximated, forming a valve. The outer fibrous coat forms a second valve which firmly closes the opening of the arteries.

Torsion as a means of checking hemorrhage became extremely popular at this period; it was introduced into England and Germany. The best known surgeons and students of the day practiced the method and wrote upon it. Among these may be mentioned Fricke 1830, Robertson 1830, Rush 1830, Froriep 1831, Buet 1831, Bedor 1831, Jobert 1831, Leclerc 1831, Detorres 1831, Delpech 1831, Foucoude 1832, Ott 1831, Lorch 1832, Textor 1832, Velpeau 1832, Clot Bey 1833, Fricke 1833, Von Gräfe 1833, Brockmüller 1833, Schröder 1834, Costello 1834, Dupuytren 1834, Lisfranc 1834, Boyer 1835, Manec 1836, Sanson 1836, Ungar 1836, Dietrich 1836, Gröfe 1837.

There was a singular absence of adverse criticism. There was, of course, a difference of opinion as to the technique, as to whether the best results were obtained by twisting the free vessel or seizing it above in a second pair of forceps, as to whether the vessel should be twisted through completely or only partly through. But on the merits of torsion by whatever method carried out there was a general agreement, it being generally conceded that twisting, though more troublesome than ligature at the time of operation, greatly lessened the dangers of secondary hemorrhage and afforded a better opportunity for healing by first intention. And here occurred a singular thing and one difficult to explain—torsion, having been thus brilliantly heralded and successfully employed in hundreds of cases, was gradually abandoned by the active surgeon. Few references are found to it in literature after 1838, the most notable of these perhaps being communications from Blandin 1841, Devienne 1843, Lauer 1844, and Hönish 1861. The method was practically abandoned when Syme in 1868, by a brief publication in the Lancet advocating its use, again revived interest in it. Bryant, and about the same time Humphrey, experimented on dogs, horses and human cadavera, and gave the method clinical trial in hospital cases, thus repeating the experience of Amussat and his contemporaries, and arriving at practically the same conclusions.

The method again became popular for a time and was well represented in the literature of the day, some fifteen or twenty papers being contributed to the subject in the next few years. Again the method was generally commended, though Ogston (Lancet, April 17, 1869), as the result of a few experiments in the human cadavera, holds that vessels secured by torsion are liable to secondary hemorrhage, especially when the arterial tension is increased upon reaction from shock. He states that his experiments show it is a dangerous hemostatic, since while some of the twisted vessels withstood a tremendous pressure of mercury, others yielded as soon as the fluid metal was poured in with a pressure of less than two inches. He holds, however, that torsion is suitable for small vessels, and that the surgeon should make a judicious choice of both torsion and ligation in his operations.

Humphrey (Brit. Med. Journ., Vol. I, 1869) so clearly describes the effect of twisting upon vessels, and reaches results from his experiments so similar to mine, that I in part give the tenor of his communication. When the artery is seized and twisted the inner coat breaks usually just above the grip of the forceps, since here the twisting is the most marked, and this break takes place before the outer coat begins to give way. In continuing the twisting the fibres of the outer coat also give way, leaving a pointed end composed of the torn shreds of this coat firmly compressed together, sealing the vessel and holding in contact the lacerated edges of the inner coat. The twisting has another effect, that is, after the inner coat is ruptured the subsequent twisting detaches it from the outer coat and turns it upward, forming a valve or inverted funnel. Experiments with mercury to determine the resistance offered by torsion against the escape of fluid show that a well-twisted human carotid or femoral generally supports a column of from 12 to 20 inches of mercury, but sometimes when the torsion is performed in precisely the same manner in the same vessels the metal escapes under a lower pressure. It is not possible to be sure of so twisting a large artery as to enable it to bear a column of more than a few inches. In the innominate, common iliac, and especially the aorta, the results are less satisfactory. The mercury first distends the vessel just above the twist and to some extent by its pressure untwists it; it then traverses the funnel-shaped aperture of the inner coat and passes to the twisted outer coat, comparatively slight pressure sometimes sufficing to carry it thus far; the further escape entirely depends upon the outer coat, the mercury either breaking through or causing a gradual untwisting. Humphrey found that the artery bears a higher column of mercury when its end has been quite twisted off than when this has been only partially done. The results of twisting with two forceps were not so satisfactory. The rotation of the artery upon its axis takes part for some distance above the part seized by the twisting forceps when the arteries are seized. Usually the coats immediately beneath the forceps give way, and the artery above unfurling itself, tends to complete the twisting and tearing of the coats nearer to the forceps. The vessel may give way higher up and undergo complete torsion at one or more places. With a ligature a well-tied artery bears a column of 30 inches or more of mercury, an unnecessary resistance, since about six inches of mercury represents the blood pressure.

For several months at the time of writing his paper he checked hemorrhage entirely by twisting, thus treating the femoral and other large arteries. He has never yet known an artery bleed in the human subject after he was sure that it had been really twisted. He has always twisted the end of the artery quite off, requiring 10 or 12 rotations, and continues twisting until the severance is quite complete, also being extremely careful not to make any traction upon the vessel while this twisting is going on. He holds that in amputations and other operations, all vessels, even up to the size of the femoral artery, as a general rule may and should be secured by torsion, that healing of wounds may be thus expedited, and that in the greater number of operations ligature may be superseded by torsion.

Bryant's experiments and clinical trials proved the full

reliability of torsion. He differed from Humphrey, however, in holding that the artery should not be twisted off, but in the case of large vessels rotation should be continued only until the sense of resistance was overcome. In his Practice of Surgery he states that in Guy's Hospital up to 1874 there were 200 consecutive amputations of the thigh, arm and forearm in which all the arteries had been twisted. One hundred and ten of them had been of the femoral artery, and there was not a case of secondary hemorrhage. Indeed, since torsion has been generally practised in the hospitals they have learned no longer to expect this complication. In amputations where hemostasis was accomplished by ligature, 7 per cent. of the fatal cases, or 1½ per cent. of the whole number, were lost by secondary hemorrhage.

In 1870 Tillaux (Bull. et Mémoire de la Société de Chir., tom. II, p. 231) resuscitated torsion in France. Since this year he states he has exclusively employed this method in both minor and major operations in the service of three active hospitals, and in not a single case was there primary or secondary hemorrhage. The twists never pass higher than half to four-fifths of an inch above the point of seizure. The sheath prevents the extension of the twist. In the case of the large arteries it is always thick and resistant and completely immobilizes the vessel.

Hill had good results in 70 operations. His conclusions are: Torsion is applicable to arteries of all calibres, and especially suitable to large arteries. A single forceps is necessary; the artery should be seized in the bite of the forceps. Twisting must be carried to complete detachment of the portion seized. Folding in of the inner tunics is useless. Inflamed and atheromatous arteries are efficiently treated by torsion. Primary healing is encouraged by this method, primary bleeding is checked as readily by torsion as by ligature. The dangers of secondary hemorrhage are much less after torsion than after ligature.

M'Donnell (Medical Press and Circular, 1876, I, p. 153) writes as though torsion were becoming an established practice. He quotes Mr. Colles' words: " In Steevens Hospital my colleagues and I have seldom resorted to any other means of arresting hemorrhage, even from the largest vessels, and we have never had reason to regret the adoption of the practice."

Finally Murdoch (American Practitioner and News, Vol. X, p. 126) states that since 1872 he has used torsion for the arrest of hemorrhage after all operations, to almost the entire exclusion of all other methods. The femoral has been twisted over a hundred times, the anterior and posterior tibial over three hundred times, the brachial eighty-one times, the axillary and popliteal each eighteen times, without a single case of secondary hemorrhage. The method employed has been that of free torsion. The vessel was seized in a pair of forceps which will hold the end of the artery firmly, and with serrations sufficiently blunt to prevent cutting of the part seized by the blade. It was then drawn out, as in the application of a ligature, and three or four sharp rotations of the forceps were made. In large arteries such as the femoral the rotations were repeated until the sense of resistance ceased. The end should not be twisted off. This method was also resorted to in all other surgical operations, such as ampu-

tations of the female breast, the removal of tumors, the excision of joints, etc. In the thousands of cases to which torsion was applied there was not a single instance of secondary hemorrhage which should be fairly attributed to this method of controlling bleeding. Murdoch states that the advantages of torsion are the great facility with which it is applied, the great security which it affords against secondary bleeding, and the more rapid healing incident to the absence of any irritating or foreign body. In regard to the greater facility with which torsion is applied, he states that any one skilled in both methods will readily concede the advantages of this claim. No assistance is required; but three or four turns of the forceps are needed, requiring far less time than the application of a thread; the delay incident to the slipping or breaking of the ligature is entirely obviated. The greater safety of the method is abundantly proven by the figures which he quotes, and the favorable effect on healing is a self-evident proposition.

As to my personal experience with torsion I have performed many experiments with animals, have twisted the arteries in the cadaver, and have employed this method of arresting hemorrhage in perhaps the majority of operations which I have performed in the last six years. The results of my experimental research were practically the same as those announced by Amussat, Bryant, Humphrey and Tillaux, or with slight differences which have an unimportant bearing on the object of my communication to-night.

As to the comparative merits of limited torsion, that conducted by two pair of forceps, one seizing the artery transversely above and limiting the extent of the twist, or free torsion, but a single pair of forceps being used, of complete torsion, the end of the vessel being twisted off, or incomplete torsion, the end of the vessel seized in the forceps being allowed to remain, it seems fairly clear that the best results are obtained by free incomplete torsion, this method being the simplest, and according to experimental research best withstanding hydraulic pressure. It is also clear that by all the various methods of torsion hemostasis may be safely accomplished, and that in the pre-antiseptic period this method practically did away with secondary hemorrhage. The reason for its neglect by surgeons during this period is hard to understand. Because the method required separation of the artery from surrounding tissues it was more troublesome and time-consuming, since ligature *en masse* was extremely popular, but little effort being made to free arteries before applying the thread. It is also probable that the method did not lessen mortality, indeed Bryant states as much; the reason in this case being probably because an amputation, for instance, with twenty ligatures hanging from it was better drained than one in which no ligatures were used; hence the sepsis was more likely to remain local in the former case.

At the present day, when the ideal ligature material is yet to be discovered, and when the necessity for drainage rarely exists, torsion should play an active rôle in our treatment. Under ordinary circumstances [illegible] for healthy wounds it is safe, is time-saving, and leaves the wound free of foreign bodies.

Experience in thousands of cases has shown that there is no danger of [illegible]

It is applicable to atheromatous vessels, since in these the outer coat, the efficient bar to bleeding, is still strong. Clinically I have found the ligature easier of application in deep-seated wounds where the vessel could not be clearly isolated, in inflammatory tissue where the vessels were adherent and often brittle, in securing veins close to their origin from a large trunk, as in the Halsted operation for carcinoma of the breast, and in the checking of bleeding from two or three small points lying close together. Under other circumstances and in the ordinary operations by means of forcipressure alone, and in the case of small arteries and veins, the vessels being seized direct and not through a thick mass of intervening tissue, or if the vessel bleeds on removal of the forceps by the further application of torsion, but few ligations will be required. The failure of torsion is in the case of small vessels often due to seizing of the vessel transversely. As the forceps is twisted the artery is wound around its beak and is finally ruptured, retracting beyond easy reach and bleeding more freely than before, or the artery is not grasped at all, a mass of the neighboring tissue being seized and twisted off, or the artery is seized in the midst of a mass of connective tissue but slips from the grip of the forceps as the twisting is continued, perhaps bleeding into the small sac made by the matting together of the connective tissue. When the method is rightly applied the bleeding is at once arrested; where it is difficult of application the ligature should be used.

Indeed in this method and others which I have advocated to-night, it has not been my purpose to urge torsion to the exclusion of others more commonly employed, but rather to call attention to some useful aids to the practising surgeon, holding that best results are obtained by altering methods to suit varied conditions, rather than in subjecting all conditions to one method of procedure.

DISCUSSION.

DR. KELLY.—This question of torsion does not touch the gynecologist so closely as it does the general surgeon, because the abdomen would be the last place, in spite of the best statistics presented, where we would dare trust solely to the twisting of a large artery. Bleeding from an external wound can be seen at once and readily controlled, but in abdominal surgery the trouble would be quite serious by the time the abdomen was opened.

I have listened, however, with much pleasure to Dr. Martin's paper, for in the great revolution surgery has undergone recently we have fixed our attention too closely upon certain principles, and in the process of reconstruction have relegated many useful things to the surgical waste-basket. We might well go carefully over old methods and operations and readjust and utilize them *mutatis mutandis*.

DR. PLATT.—I have used torsion with the smaller vessels, but when I have cut down upon the larger vessels I have invariably tied them, being afraid to run the slightest risk. In the matter of plastic surgery, torsion is the best method, for if you put a ligature close under the skin it is pretty sure to suppurate out and leave a little fistula.

DR. KELLY.—I would add that we now have a perfect method of sterilizing catgut, with cumol boiling at 155° centigrade, and we can use the gut with perfect freedom, without fear of after-trouble. We are therefore almost as well off as if we used torsion; we simply add a little absorbable animal substance which disappears in a few days when it has done its work.

PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS HOSPITAL MEDICAL SOCIETY.

Meeting of November 4, 1895.

DR. FLEXNER in the Chair.

Exhibition of a case of Hemiplegia with Motor Aphasia, occurring in a Patient convalescing from Typhoid Fever.—DR. BLUMER.

The case which I exhibit to-night illustrates one of the rare complications of typhoid fever, viz., hemiplegia with motor aphasia. The little girl was brought to the dispensary because of a paralysis of one side. The family history is negative and there is nothing of importance in her personal history. We saw her for the first time on the 23d of last August. Seventeen weeks before that she had an attack of typhoid fever, typical and somewhat prolonged. The attack began with malaise and a feeling of weakness; then there was a continuous fever for ten weeks, with constant headache, diarrhœa, pain in the abdomen, and mental dullness. Her brother had an attack at the same time. About one week after she had begun to eat solid food she was suddenly seized with violent convulsions. This attack occurred about eight o'clock in the morning while she was at breakfast. She was immediately put to bed. The convulsions were confined almost entirely to the right side as far as the extremities were concerned. The movements were also quite marked in the head, but I have been unable to find out definitely from her mother whether they were confined to the right side of the face or not. These movements were violent from eight o'clock in the morning till four o'clock in the afternoon. At four o'clock the movements of the head and face almost ceased, but the movements in the arm and leg continued with greater or less intensity for two days. During that time the child seemed unable to speak and did not seem to understand anything. About five weeks after the onset of these convulsions she began to recover the use of both limbs on the right side, which up to then had been paralyzed, and some power of speech. At first she did not recognize any of her family, or, rather, probably recognized them but miscalled them, calling her father "mother," and so on. At the time she was brought to the dispensary she was able to walk, although she dragged the right foot a little. The arm had not recovered like the foot. There was no evidence of facial paralysis at that time and no hemianopsia. She apparently at that time had a pure motor aphasia. She understood perfectly all that was said to her, would do any-

thing she was asked to do, but when an object was held up to her, while apparently recognizing it, would often call it by the wrong name. Some few things she would name correctly. Since she has been in the Hospital she has been improving steadily as far as speech is concerned and now names most objects correctly. There has also been some slight improvement in the walking. In the arm there has been no apparent improvement. The arm is generally held at right angles, as you observe it; it is a rigid paralysis. She is unable to move her elbow and can hardly move her fingers. She shows no signs of facial paralysis; the tongue is protruded straight, and there is apparently no abnormality about the muscles around the angles of the mouth.

We have here a complete right-sided hemiplegia originally with motor aphasia. The question is, what was the lesion which produced it? The lesion evidently implicated the motor areas in the cortex and also the area presiding over motor speech, that is to say it implicated the ascending frontal and ascending parietal convolutions, and also the posterior portion of the third left frontal convolution. Was the lesion a hemorrhage, was it a thrombosis or an embolus? The age of the child is rather against the lesion being a hemorrhage, as is also the fact that the irritative lesion lasted such a long time. In case of a hemorrhage of such an extent, in all probability destruction of the tissue would have taken place at a much earlier period and the irritative lesions would have ceased. As for an embolus, there never was any source of origin for an embolus at all. Of course the child had gone through a very long period of illness, and in such illnesses there is always a chance for the formation of thrombi in the auricular appendages, and the dislodgment of these thrombi with subsequent emboli and softening. It is impossible, of course, to make an absolute diagnosis between thrombosis and embolism in this case. We have been led to make the diagnosis of thrombosis by the similarity of this case to another case which occurred in this hospital earlier in the year. In that case the patient was seized with convulsions, which were not, however, one-sided as in the child's case, but which terminated fatally in a short time. At the autopsy, extensive thrombosis of the greater number of the branches of the middle cerebral artery was found. In the present case the first three branches of the middle cerebral—the inferior frontal, the ascending frontal and the ascending parietal— were probably involved. We have two arterial trunks to be considered. Sometimes the inferior frontal and ascending frontal branches arise from a single trunk; sometimes the ascending frontal and ascending parietal branches arise from a single trunk; and it is possible that all three might arise from a single trunk. In the latter event we would have to take into consideration only a single thrombus in the common trunk. We can, however, assume that there was a partial thrombosis of the middle cerebral, the thrombus covering the origin of these three branches and cutting off the blood supply. The fact that the signs of irritation existed so long before the actual paralysis would rather point to softening than to primary destruction by hemorrhage.

These cases are apparently pretty rare. I have been able to find but six or seven cases in the literature at my command.

some with convulsions and some without. There was one case reported by Doctor Gee in 1878 which was almost identical with this. He was inclined to think it was due to embolus, although there was no heart lesion to account for it. He thought it might have originated in one of the auricular appendages.

DR. THAYER.—I had the good fortune to observe two quite similar cases while *interne* in the Massachusetts General Hospital, in the service of Dr. G. G. Tarbell, with whose kind permission these notes are communicated:

Case 1.—J. McD., aged 21, single, a currier, was admitted to the Massachusetts General Hospital on the 6th of October, 1888. His family history was good; previous history negative. He had complained for two weeks of headache and "sore bones." Four days before entry he gave up work and went to bed. Physical examination showed a large, well-formed man: well nourished; face flushed; conjunctivæ injected; lips and mucous membranes of good color; tongue moist, thick yellow coat. The abdomen was rather depressed; moderate tympanitic gurgling in the ilio-caecal region; slight tenderness in the epigastrium; a few rose spots on abdomen and back. The area of splenic dullness was enlarged; spleen easily felt.

Urine normal; acid; 1020; albumen, trace; sediment slight; hyaline and finely granular casts. 7, 10, 88.—"Stupid and apathetic; numerous rose spots." 9, 10, 88.—No change. 11. 10, 88.—"To-day has been particularly stupid, puts tongue out only when spoken to sharply. Swallows milk when it is poured into his mouth, but cannot be made to suck it through a tube. Pulse rather small, somewhat dicrotic." 12. 10. 88 (10th day).—"At about 1 A. M. the ward tender noticed that the patient was unable to move the right leg and arm. At 12.15 A. M. the patient was seen in bed, on his back, face flushed, eyes half closed, pupils rolled upwards, equal, respond to light. Conjunctivæ injected; wrinkles on the left side of the mouth slightly more marked than on the right. Patient is very stupid, will not protrude the tongue when asked to. When asked questions, several times made a noise as if trying to answer, but seemed unable to speak. Unable to move right hand, arm, or leg. The arm or leg can be placed in any position without movement. When asked sharply to move the arm he pulls it with the left hand. Cutaneous reflexes present on the left side, absent on the right. Marked ankle-clonus on the right side; bicipital reflex increased on the right. Patellar and tricipital reflexes not markedly increased on the right. Pulse 80, regular, of moderately good strength." 13, 10, 88.—"This morning the condition of the patient is about the same. In the sputa-cup is about an ounce of a viscid, finely aerated mucous and blood-stained expectoration; a purulent matter. Some of the blood in streaks, some rather intimately mixed and dark colored." 14. 10. 88.—Yesterday afternoon and to-day the patient seems to be brighter; smiles when spoken to; tried to speak, but is unable to articulate words." 18. 10. 88.—The temperature, which had been gradually falling, reached the normal point, and the following note was made: "The patient is decidedly brighter; when spoken to he seems to understand what is said, but shakes his head, indicating that he cannot speak. Cannot protrude tongue, but opens his mouth freely. The flexing of

the mouth to the left side has grown much more marked. On more careful examination it seems much more doubtful whether he understands the remarks made to him. He looks brighter, but on a more careful examination he appears to shake and nod his head, usually nodding without regard to the question asked." (It may be said that the nurses who were constantly about him were convinced that he understood perfectly what was said.) 20, 10, 88.—"Temperature normal. From the 25th to the 7th of November patient had slight rises of temperature and cough with the blood-stained expectoration and evidences of a consolidation at the left base. On the 30th of October he was able to protrude his tongue." 13, 11, 88.—" Improving; bright and cheerful; cannot talk; makes a meaningless noise to attract one's attention; cannot copy any noise or word." 27, 11, 88.—"There is still moderate dulness through the left side, with somewhat modified respiration and medium and coarse râles on inspiration." 3, 12, 88.—"Can turn over in bed." 6, 1, 89.—"Can pull himself up in bed and stand alone." 10, 12, 89.—"Can say a few words indistinctly; can write his name with his left hand." 11, 1, 89.—"He desires to go home; can walk fairly well, though cannot go up and down stairs. Can understand what is said to him apparently perfectly well; reads the paper, can say but a few words. As far as can be seen, understands the use of articles shown him but cannot name them. Can move right arm from the shoulder, but can move muscles of forearm but little; is bright and cheerful, but sometimes cries when he fails to do something which he attempts."

Case 2.—J. D., 10 years of age, school girl, was admitted to the Massachusetts General Hospital on the 21st of November, 1888, with characteristic symptoms of typhoid fever of five days duration. The urine was free from albumen. Rose spots were noted for the first time on the 25th of November. On the 9th of December, the twenty-third day of the disease, it was noted that the patient was " dull, in a typhoidal condition; defecation and micturition involuntary." 10, 12, 88.— " Yesterday afternoon the nurse noticed that the child did not answer questions and lay persistently on the right side. This morning cannot speak; apparently understands questions; tongue protruded straight when asked; no facial paralysis; motion and sensation in legs good; right arm and hand are moved slowly and with difficulty; grasp of right hand decidedly weaker than left; reflexes apparently not exaggerated." 13, 12, 88.—" To-day made a few sounds; nurse thought she said 'milk.'" 16, 12, 88.—"Has said several words this morning; calls ' nurse '; cries out; smiles when spoken to, evidently understands what is said; uses right hand and arm almost as well as left." 20, 12, 88.—"Talks a good deal; says, ' yes, yes,' and ' no, no ' to herself." 27, 12, 88.—"Talks more and expresses herself fairly well." 4, 1, 89.—"The temperature was normal to-day for the first time." 18, 1, 89.—The patient had been up and about, but while she talked and understood what was said, she appeared decidedly weak-minded and irritable; very dull; it is noted that she "still seems stupid and weak-minded." 23, 1, 89.—"Has been doing perfectly well; walking about; hungry all the time; mentally still stupid and below par. Two days ago insisted that one of the patients had stolen her clothes and

that she had been sent for to come home. Mother came for child to-day and she was discharged."

Thus, in each of these instances, during the height of an uncomplicated typhoid fever (10th and 24th days), in young and robust individuals, there appeared suddenly a right-sided hemiplegia with complete motor aphasia. In neither case were there convulsions.

I had not seen another instance of this nature until the case of my unfortunate colleague, to which Dr. Blumer has referred. The lesion in each of the Boston cases was probably a thrombosis; there were none of the ordinary sources for an embolus; the heart was in good condition in each case. Arterial thromboses, though rare, do occur in other regions, while venous thromboses are, of course, common.

Meeting of January 20th.

DR. FLEXNER *in the Chair.*

Some Points regarding the Pathology of Malaria.—DR. BARKER.

When the work of Drs. Thayer and Hewetson upon malaria was in course of preparation it was thought desirable that a study of the tissues from the fatal cases of the disease should be appended. The material at hand was comparatively limited, for very few cases of malaria come to autopsy under the quinine treatment. The patients that died were either pernicious cases or they suffered from some complication. Of the tissues studied, three cases were of æstivo-autumnal fever, and there was one case of double tertian malaria. I do not intend to discuss this evening in detail the findings in these autopsies, since a full account of them will be found in the Johns Hopkins Hospital Reports, under the title "A Study of Some Fatal Cases of Malaria." I have thought that it might be worth while to bring before you, freed from detail, some of the more general points concerning the pathology of malaria.

First, as to *the relation of malaria to cirrhotic processes*—the occurrence of focal necroses in the liver and spleen in malaria, and the bearing that these may have upon the etiology of cirrhosis. For a long time it has been disputed whether or not malaria has anything to do with the causation of fibroid processes. Many have claimed, for example Frerichs and Lanceraux, that there was a chronic paludal hepatitis of malarial origin. Chronic nephritis and cirrhosis of the brain and spinal cord are sometimes, it is said, due to malaria. Chronic interstitial pneumonia has also been traced to a malarial origin by Laveran.*

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* The dispute as to whether cirrhosis of the liver can be a sequel to malaria or not has perhaps been warmest. Dr. Osler, in his Practice, points out the necessity of considering other etiological factors, *e. g.*, alcohol, syphilis, tuberculosis, even when malaria appears to stand in a direct relation to the disease. Of the many persons who have had malaria, very few of them have developed cirrhosis of the liver afterward. Dr. Welch states that in his autopsies in New York he met with only one case of cirrhosis of the liver that could be said to be due to malaria ; that occurred in an Algerian. Bignami, the most important writer on the changes in the tissues in malaria, thinks that malaria may undoubtedly lead to subsequent cirrhotic processes, and he traces with great acumen the changes that gradually occur as a result of repeated attacks of malaria.

If, as pathologists are inclined to think, cirrhotic processes as a rule have their starting-point in a degeneration of tissue elements, then it would not seem strange did malaria have sclerotic changes as a sequel, for we have in this disease multiple examples of cell-death. For example, in the study of Case C of the series, multiple focal necroses were demonstrable in the liver and spleen, quite analogous to those described by Dr. Reed in typhoid fever and by Drs. Welch and Flexner in diphtheria, as produced experimentally by the bacilli which cause these diseases as well as by the introduction of the toxines which the bacteria produce. An interesting finding in association with these areas of necrosis was the occurrence of multiple capillary thromboses. It seems possible from a study of these cases that a direct relation can be traced from the capillary thromboses to some of the areas of necrosis, at least in the liver. It has been proven by Dr. Flexner, in his experimental work with blood-serum, that cirrhotic changes can result from focal necroses in an organ. It would not be surprising, therefore, that a disease like malaria, associated as it is sometimes with focal necroses, should occasionally be followed by cirrhotic changes.

Besides the focal necroses, which are probably due to toxines (although as a matter of fact the malarial toxines have not yet been isolated), we can think of other conditions in malaria which could be the starting-point of chronic changes. For example, the changes in the blood plasma which occur in malaria must be profound. A great many red blood corpuscles are broken up, a large number of leucocytes are altered, large numbers of malarial parasites are present, growing, multiplying, dying. We know from experimental work that even slight changes in the character of the blood plasma can lead to marked alterations in the cells of the tissues. The question of an alteration of the isotonie of the blood serum in malaria is an interesting one, particularly as regards malarial hæmoglobinæmia and hæmoglobinuria.

The relation of the melanæmia to the possible cirrhotic processes is to be considered. We know that very inert substances, like carbon or stone, in the lung, can give rise to chronic changes. Why could not the malarial pigment resulting from the destruction or from the segmentation of the parasites, give rise to chronic interstitial inflammation? Malarial pigment is deposited in the periphery of the hepatic lobules, and it is there that fibroid changes are most frequently located.

Any condition which leads to intermittent hyperæmia of an organ has generally been looked upon as of importance as regards the etiology of chronic interstitial inflammation. In a single malarial infection, with every paroxysm there are changes in the vascularity of the organs, particularly in the liver and spleen, and in persons subjected to repeated attacks of this disease the varying size of these organs is a marked clinical feature.

Another possible etiological factor in the production of a cirrhosis is disturbance of digestion. In many cases of malaria associated with severe diarrhœa, there are thrombi of infected corpuscles filling up the capillaries in the surface of the intestine; as a result there must necessarily be marked disturbance in the processes of secretion into the alimentary canal and of absorption therefrom.

But given all these possible etiological factors for a primary degeneration of the cells in malaria, still individual predisposition or resistance must play an important part, for we know that the great majority of cases of malaria are not followed by extensive cirrhosis.

The second point I wish to refer to is *the occurrence of bacterial infections and protozoan invasions along with malaria.* Drs. Thayer and Hewetson in their article speak at length of the multiple infections in cases of malaria, an infection with two varieties of the malarial parasite or with different generations of the same variety of parasite; but it is aside from that subject that I wish to speak.

As regards protozoan infections that may be concurrent with malaria, we know of at least one example. At the time these studies were made, the amœba coli had been found in the stools of one man who had dysentery synchronously with an attack of acute malarial fever. Since this work was done several cases of amœbic dysentery associated with malaria have been observed in this hospital. This is, it seems to me, of extreme interest, inasmuch as the writers in tropical countries have always laid great stress on the occurrence of malaria and dysentery together. Unfortunately, in neither of these protozoan diseases do we know as yet the mode of infection; the determination of this point for one disease may be of help in the study of the other.

As to the bacterial infections concurrent with malaria: many of the old text-books speak of a definite malarial pneumonia, and there is a tolerably wide polemic literature on the subject. The writings of Manson and Howard are worthy of particular mention in this connection. Dr. Osler tells me that he has found nothing peculiar to the pneumonia associated with malaria. There is as a matter of fact no proof that pneumonia in malaria is ever due directly to the malarial parasite. The cases that have been examined pathologically correspond with ordinary cases of pneumonia, and Bignami, Marchiafava and Guarnieri have had cases come to autopsy in which they have demonstrated in the lungs the micrococcus lanceolatus, the micro-organism practically always found in acute croupous pneumonia. As to bronchitis and broncho-pneumonia, which are often associated with malaria, particularly in children, it is now tolerably definitely settled that they are complicating infections due to bacteria, and apparently any one of the group of pyogenic organisms is capable of setting up a bronchitis or broncho-pneumonia in malaria.

The question of the concurrence of typhoid fever with malarial infection has been the subject of heated discussion. It is now definitely settled that a man may have typhoid fever and malaria at the same time. One such case has been reported by Dr. Osler and one by Dr. William Thompson at New York. But the great majority of cases in the literature and in practice spoken of as typho-malarial fever or typho-intermittent fever are really cases of typhoid fever. Now that the diagnosis can be so easily made, there will be no excuse for a continuance of the old confusion.

The endocarditides often spoken of as complications of malaria will undoubtedly turn out to be due to bacteria, and

not to the malarial parasite. As far as we as yet know, acute endocarditis is always bacterial in its origin, though a pure toxic endocarditis is not impossible.

Local streptococcus infection, *e. g.* erysipelas, is sometimes concurrent with malaria. We have met with one such case.

As to the concurrence of dysentery and malaria, I have already spoken of the protozoan (amœbic) form. Other forms are, as a rule, due primarily to disturbances in the capillary circulation of the gut (local accumulation of parasites), which result in alteration of nutrition, or even in necrosis of the surface; bacteria may then easily get in and lead to further changes.

Case D of our series formed a most interesting exception to the general rule of mixed infections. The case was one which had been treated in the ward for a long time for acute nephritis and had all the clinical signs of acute nephritis. At autopsy the individual was found to have acute nephritis, and in addition an acute double tertian malarial fever and an acute general infection with the streptococcus pyogenes. The small capillaries all over the body, and particularly in the kidneys, were filled with thrombi, consisting often partly of fibrin, but mainly of cocci in chains. The number of malarial parasites in this case was simply enormous. In many of the blood-vessels the active recent parasites, that apparently had not undergone degeneration at all, exceeded in number the white corpuscles. In such a case we could think of counting the number of malarial parasites in a cubic millimeter of blood and would expect to find them standing in number somewhere between that of the red and that of the white corpuscles. No such case has ever come before the notice of the pathologists here before. Dr. Councilman, who has had a wide experience in malaria, and who made the autopsy in this case, expressed much astonishment at the tremendous number of organisms present.

From this brief review it will be seen that it is possible to have very different bacterial infections associated with malaria, and the infection may be local or general. Naturally many such cases would not be cured by quinine; the quinine would destroy the malarial parasites, but might have but little influence upon the concurrent infection. In malaria, therefore, as in diphtheria, one must not forget the possibility of a mixed infection, especially in making a prognosis.

The next point to which I wish to draw your attention is *the unequal distribution of the parasites in the body in malarial infection.* It was noticed long before the malarial parasite was discovered, that pigment could be found in different organs and inside of cells in various parts of the body at autopsies on malarial patients. In the earlier studies of malaria, after the discovery of the parasites, it was noticed that the parasites were most abundant in certain organs, for example, in the liver and spleen. Since the clinicians (French, Italians, Americans) have thoroughly studied the blood in malaria, we know that there are different types of the malarial organism, and that there are differences in the distribution of the parasites in the body in different infections, which correspond to these different types. In quartan fever the distribution of the parasites is most even throughout the blood and tissues, and one can form a tolerably accurate idea of the whole number by examining a drop of the peripheral blood anywhere. But even in quartan fever, especially during segmentation, there is a tendency to local accumulation. In the æstivo-autumnal fever the distribution is most unequal, and one can form little if any idea of the whole number of parasites present from the number he can find in the peripheral blood. In tertian fever the distribution of the parasites stands about half-way between the quartan and æstivo-autumnal as regards evenness of distribution. In the æstivo-autumnal form of malaria the pathologists, by their post-mortem observations, have been able to make important contributions to our knowledge of the disease. The general work on malaria is the result of brilliant clinical observations, but as regards inequality of distribution the pathologists have naturally been better able to make contributions. Even in the same organ there may be marked inequalities of distribution. While the spleen and liver usually contain in æstivo-autumnal malaria many more parasites than the other organs, yet different parts of the spleen or liver may contain more parasites than another part of the same organ. In the brain we may find here and there a capillary thrombosed with parasites or infected corpuscles, and then in large areas scarcely a parasite can be seen. The relation of this unevenness of distribution in the brain to the clinical phenomena sometimes manifested is worthy of note. The curious mental phenomena that are exhibited by certain malarial patients, particularly in the pernicious forms, can perhaps be explained by this mere mechanical blocking of capillaries in certain areas. This would explain, for example, the transitory aphasias, paralyses, and varieties of delirium.

When one thinks of the nuclei in the medulla, how small they are and how dependent they are upon oxygen for their well-working (for example, the respiratory centre and that governing the movements of the heart), it would not be difficult to understand how thromboses of their vessels might lead to severe symptoms and perhaps to sudden death. In one case of death with bulbar symptoms, Marchiafava found thrombi of parasites in the medulla. But it must not be forgotten that in such instances, and in the transitory aphasias, etc., mentioned before, we may have to deal simply with the toxic effects of the disease, rather than with disturbances of function dependent upon mechanical obstruction to this circulation.

Another form of malaria, *malaria perniciosa algida* or *cholerica,* is dependent upon this inequality of distribution of the parasites. In this form of the disease the capillaries of the mucous membrane of the intestines and stomach are blocked with a great number of infected red blood corpuscles or large phagocytic cells. The mucous membrane may become necrotic and be cast off, and one sees severe dysenteric symptoms or extreme vomiting. Of course such a dysentery is due almost directly to malaria and would scarcely come in the class of concurrent infections, although it is probable that even in such a case the advent of other micro-organisms would accentuate the dysenteric process.

When an attempt is made to explain why the parasites are so unevenly distributed in the body, many difficulties are met with. Why, in quartan fever, are the parasites pretty evenly

distributed, while in æstivo-autumnal fever they are unevenly distributed? Bignami has considered almost every point bearing on this subject, but comes to the conclusion that our knowledge at present is too limited to afford any satisfactory explanation. Phagocytosis may in part explain the inequality of distribution. A great many of the parasites are enclosed within phagocytes; but that would not account for all the phenomena concerned. Again, the parasites tend to accumulate where the circulation is slow; and it is probable that vaso-motor influences have something to do with the inequality of distribution. That would necessitate going back to the assumption of differences in the toxines in the quartan and æstivo-autumnal types.

We are not left without analogy as regards this inequality of distribution. For example, every pathologist is acquainted with the fact that in tumors there are most curious inequalities in the distribution of the metastases. In a general carcinosis or sarcomatosis, where the tumor cells arrive in the blood and are distributed by it, it is a well known fact that the secondary nodules develop sometimes in one organ, sometimes in another. Whether this is due to primary inequality in the distribution of cells, or whether it is due to differences in resistance against the growth of the cells, or to both, is uncertain. Again, any one who has made systematic bacteriological examinations at autopsies will remember how unequal is the distribution of bacteria in acute general infections. In general streptococcus infections, for example, sometimes the organism will be present in the spleen in great numbers while only a few are obtained from the liver. In other cases the reverse may be so. Of course, in such instances one has to think whether or not he has introduced into his media as much fluid substance from one organ as from another. But even when the amount of fluid is the same the number of bacteria differs in the different organs. In acute miliary tuberculosis certain organs at times seem to be immune while other organs develop enormous numbers of tubercles. So these, then, are analogous conditions which are, as yet, not satisfactorily explained.

But in tumor metastases, bacterial infections and malarial invasions we have to do with crude mixtures of gross particles with the red and white blood corpuscles and blood plasma. A still more remarkable fact is that where soluble poisons are introduced into the blood there is an inequality in distribution. Of course, it is a physiological fact that substances that go to form the secretions are picked out by the glands, each gland choosing certain substances. Baumann has recently shown us how iodine, which must exist in the blood in extremely small amounts, can be picked out by the thyroid gland and built up into a body containing as much as 9 per cent. of iodine. Certain poisons—e. g. morphine and strychnine—we know are picked out preferably by certain organs. The toxines of bacteria in solution in the blood form focal necroses rather than diffuse necroses. If with soluble substances one meets with marked inequalities of distribution, it is not surprising that the distribution of gross particles in suspension should be anomalous. Besides it must be remembered that in malaria we are dealing with living parasites and living cells in the blood and tissues. In addition to the many and curious vital manifestations which cells are already

known to be capable of exhibiting, there may be many with which we are as yet unacquainted.

The last point concerns *phagocytosis in malaria*. I shall speak of what we have seen in our fatal cases here. First, as to the cells concerned. Certain of the leucocytes are the main phagocytes; then the endothelial cells of the blood-vessels, the cells of Kupffer in the liver and the cells of the pulp-cords in the spleen play a part. The phagocytes may contain red blood corpuscles, some healthy, some injured, some infected, some fragmented; masses of blood pigment, malarial parasites, malarial pigment. Then again they may contain other phagocytes. The phagocytes have been named by various authors in accordance with the character of their contents as "pigmentiferous," "amœbiferous," "leucocytiferous," etc., although this, it seems to me, is an unnecessarily cumbersome terminology.

One point which has interested me much in the study of phagocytosis in malaria is that there is a division of labor amongst the phagocytes. Not every phagocyte takes up these substances in the same degree. While almost any phagocyte seems to be capable of taking up any one of the table of contents mentioned above, yet as a rule certain phagocytes tend to contain one set of the substances, others to contain another set. In Case D, for example, of the series, the mononuclear leucocytes contained the majority of well preserved parasites, while the polymorphonuclear leucocytes contained a preponderance of the segmental pigment. Then again in the liver and spleen the large macrophages take up particularly the red blood corpuscles along with parasites and pigment, while the endothelial cells of the liver take up chiefly the blood pigment. I was very much interested in this phagocytosis in the mononuclear leucocytes in Case D, inasmuch as in the report of Thayer and Hewetson it is stated that it is exceedingly rare to notice any phagocytic tendencies on the part of the mononuclear elements in the fresh blood-slide, although the polymorphonuclear leucocytes are frequently observed to enclose the flagellating bodies. But in Case D in all the tissues we find parasites inside the large mononuclear leucocytes. It is just possible that they have taken up these parasites post-mortem, Dock and others having pointed out that the malarial parasites cease their development soon after the death of the host. It is unfortunate that in this case no blood examination was made during life. Had this phagocytosis on the part of the mononuclear elements occurred during life they could not have failed being detected in the fresh blood.

The physiological question of the relation of phagocytosis in malaria to bile production is of much interest, though for lack of time I must be content with merely referring to it. The phagocytes can be seen passing from the spleen. It seems to be the main cemetery of red blood corpuscles, laden with broken-up capsules and with pigment; then the blood pigment is seen in the endothelial cells of the liver, next in the Kupffer cells, and finally in the liver cells themselves, as though this were a method of transportation of raw material from the spleen to the liver for purposes of bile manufacture.

With reference to the relation of phagocytosis to natural resistance and to spontaneous cure I will say nothing, except

that the strife is still going on between those who favor the doctrine of phagocytosis and those who see in the blood-serum the main protecting mechanism.

As regards the form the parasites assume inside the phagocyte, it is easy to make out that a great many of the parasites rupture after inclusion, and one can see the lines of pigment running from the parasite out into the protoplasm of the phagocyte. Golgi thought that the parasites could multiply within the phagocytes, and Bignami still believes that latent infection is to be explained in many cases by the long continued life of the parasite within the phagocyte. Certainly forms of bacterial infection are described which have analogies with this view.

Then, finally, as to the inclusion of some phagocytes by other phagocytes. It makes a very interesting picture to see a huge phagocyte containing within it one, two or several of the cells of the body. Sometimes phagocytes are included along with non-phagocytic cells, and sometimes a phagocyte is seen inside of a phagocyte, which in turn is within a third larger phagocyte. Sometimes the huge phagocytes look degenerated; in such a case we can conceive of a young phagocyte going into the large phagocyte after its contents or even to eat up the dying protoplasm. On the other hand sometimes the included phagocyte looks degenerated, in which case we can think of the large active phagocyte taking up the small one into its substance—eating up its neighbor. These curious phenomena, which I have perhaps too fancifully spoken of as the cannibalistic and thieving tendencies of phagocytes, are among the many attractive problems connected with the sociology of cells which the future has to solve.

I have placed under the microscopes specimens which show (1) focal necrosis in the liver; (2) capillary thromboses in the liver, in Case D; (3) periportal infiltration with round cells; (4) vein in lung containing enormous numbers of malarial parasites; (5) makrophages in spleen; (6) malarial parasites enclosed in mononuclear leucocytes; (7) thrombi of parasites in mucous membrane of stomach. The beautiful plates which I pass around are from drawings made by Mr. Max Brödel from the microscope. I have never seen a more accurate reproduction in drawing, of what can be seen through the microscope.

DR. OSLER: Malarial cirrhosis seems to be remarkably rare in this country. No well marked instance of it has ever fallen under my observation. I have frequently looked for it at the Philadelphia Hospital, where we had a very large malarial material, and I think, with the exception of the one case mentioned by Dr. Welch, I do not know of any instance in the North in which the condition has been found. We have had only one case here in which clinically we suspected that the cirrhosis might be malarial.

With reference to the irritation of the malarial pigment as a cause of fibrosis, it is interesting to call to mind the observation which Dr. Welch brought before us here a few years ago, namely, a form of anthracotic cirrhosis in which the fibrosis in the liver seemed to be due to the amount of pulmonary carbon which had reached the liver in roundabout ways.

DR. THAYER: There is as yet no absolute proof that the malarial parasite produces a toxine, and yet there are observations which are rather suggestive, particularly those by Brousse and by Roque and Lemoine, who have shown an increased toxicity of the urine just following the attack; and by Queirolo, who has shown that the sweat during the sweating stage is much more toxic than that obtained under other circumstances. It must be said, however, that Botazzi and Pensuti have shown that much, if not all of this increased urinary toxicity may be accounted for by the increased excretion of certain potassium salts and urobilin, as well as by the presence of peptone. Taking into consideration, however, the various symptoms of malarial fever, there is, by analogy to the other similar conditions, every reason to believe in the existence of some soluble toxic substance. Particularly suggestive are the focal necroses of which Dr. Barker has spoken.

Another evidence of some grave alteration in the blood serum is shown in the hæmoglobinuria which occurs in some of the graver malarial infections.

With reference to the occasional paucity of parasites in the peripheral circulation, I have seen several very severe cases where, at certain times, but very few parasites could be found. I have never, however, seen a severe case where they could not be found on careful search. The fact that in certain severe cases they were present in such small numbers in the peripheral circulation led Baccelli to think that in some instances a small number of parasites might produce the gravest symptoms owing to their excessive virulence. In their recent admirable article Bastianelli and Bignami rather dispute this and say that in no case of pernicious fever in which they have studied the tissues post-mortem have they failed to find a total very large number of parasites; very few perhaps in the peripheral circulation, but numerous in the spleen, brain, liver, or gastro-intestinal tract.

With regard to the localization of the parasites in the pernicious cases:—In a case of comatose pernicious malaria which recovered, there existed while the patient was entirely comatose a clonic spasm of the lower facial muscles on the left side, which disappeared entirely with the cessation of the paroxysm. We have had within the last six months one case of algid pernicious malaria. This man gave the history of having had quite an active diarrhœa for three or four days, slight attacks of fever and an occasional chill. Dr. Smith noticed the man as he was led into the dispensary one morning at about 11 o'clock, and was impressed by the cyanosis and apparent prostration of the man; upon examination, he found him cold and pulseless. He was put to bed and was dead within two hours and a half. His mind was perfectly clear; he was excessively weak; voice husky; skin cold and clammy; cyanosis very marked; quite the picture of a man in the algid stage of Asiatic cholera. At the autopsy there was very marked injection of the mucous membrane of certain parts of the intestinal tract, particularly in the upper part of the large intestine, while on examination of fresh specimens the capillaries were seen to contain much pigment. The brain showed little or no melanosis. The specimens have not been thoroughly worked up as yet.

It is a very interesting fact with regard to phagocytosis that while, in fresh malarial blood, a large number of the phago-

cytes that one sees are mononuclear, yet I have never seen any active phagocytosis by mononuclear leucocytes. Occasionally one sees in the fresh specimen a fairly well preserved parasite in polymorphonuclear leucocyte. Occasionally, also, we may see pigment and some of the remains of the parasite lying within a vacuole-like space within the leucocyte. Within a few days I have seen a fragment of parasite taken up, the mass of pigment becoming surrounded by an apparent vacuole and presenting an appearance which might well have suggested that the whole structure represented a complete engulfed parasite. Bignami makes the suggestion that some of the so-called "latent" cases and some of the relapses may be due to the preservation of certain forms of the parasite within leucocytes. In his last article he suggests that perhaps the best explanation that one can offer is the supposition that there is some encysted form of the parasite which has as yet escaped our observation.

Dr. Barker: I did not speak at all of the round-cell-infiltration of the liver in one case which we saw. It might have been accidental. Dock has described, however, a similar case of periportal infiltration with round cells.

It is rather depressing, in view of the immense amount of clinical and pathological work which has been done on malaria, and of the fact that the parasitic nature of the malady is settled beyond all reasonable doubt, to find a writer in one of our best medical weeklies describing certain changes, perfectly familiar to the modern hæmatologist, which are sometimes visible in the red blood corpuscles, and asking the question, "Is there a malarial parasite?" Then again a prominent army surgeon in India has recently, it is said, stated that there is no malarial parasite; that what has been described as the malarial organism is the stained nucleus of the leucocyte!

Pleuro-Peritoneal Tuberculosis.—Dr. Osler.

I exhibited this child, Hannah W., aged 11, here last winter, at which time she had a remarkable enlargement of all the salivary and buccal glands, and of the lachrymal glands and of the spleen, a condition which persisted for nearly a year. We were in a good deal of doubt as to the nature of this chronic enlargement, until she developed syphilitic disease of the bones of the nose. Under the use of iodide of potassium, the swelling of the glands has gradually subsided, and the spleen, too, has reduced in size. When she first came under observation, March 30, 1894, there were one or two enlarged lymph glands in the posterior cervical triangle on the right side. About the middle of April of this year she began to have fever, the temperature rising to 103°, and it was noticed that she had slight cough and a little shortness of breath. She gradually developed a right-sided pleural effusion, which came on insidiously, without pain.

On the 27th of April a needle was introduced into the eighth space, and a clear yellow fluid was withdrawn, which bacteriologically was negative. She had occasional slight diarrhœa, but neither the stools nor the small amount of sputum contained tubercle bacilli. The temperature was elevated to between 101° and 102°. During this febrile period the enlargement of the glands subsided remarkably. The fluid persisted throughout the month of June, but gradually

subsided, and on the 19th there was scarcely any difference between the percussion note of the two sides. The patient went out at intervals to stay with her relatives. Though she coughed occasionally and had slight fever, tubercle bacilli were never found.

Throughout August and September she lost a good deal in weight. Early in the latter month it was noticed that there was marked abdominal distension and some tenderness. At first palpation could not be readily made on account of the rigidity, but subsequently irregular masses could be plainly felt in the lower portion of the abdomen. The spleen had reduced very much in size. The bowels were constantly a little relaxed; two, three, and sometimes four stools, but tubercle bacilli were never detected. Throughout the months of September and October she had very slight fever; the morning temperature was often very low, down to 97°; in the evening not much above 100°.

For the past six weeks the temperature has shown the same irregularity, rising at intervals to as high as 102°.

At present, as you can see, she is a somewhat delicate-looking child. The salivary, lachrymal and buccal glands are of normal size. There is no longer any effusion in the right pleura, but in the abdomen there can be felt several irregular nodular masses, one group of which extends through the lumbar and left inguinal regions, and the other is midway between the navel and Poupart's ligament on the right side.

The pleurisy of insidious onset, which has gradually subsided, the progressive loss in weight, the irregular fever, and the development under observation of nodular masses in the peritoneum, leave very little question that this child is the subject of a pleuro-peritoneal tuberculosis.

Intubation of the Duodenum.—Dr. J. C. Hemmeter.

Intubation of the duodenum is not an analogous procedure to the passage of a rigid tube into the larynx, in occlusion of the lumen of that passage by pseudo-membrane or œdema. It is possible that intubation of the duodenum may be interpreted as meaning the insertion of a rigid tube through the pylorus, to secure permeability into the duodenum in cases of stenosis resulting from cicatricial contraction, or of stenosis resulting from neoplasm. The intubation referred to in this report, however, is simply the passage under normal conditions of a tube through the mouth, œsophagus, stomach and pylorus into the duodenum.

The possibility of this procedure occurred to me during a long series of experiments in the biological laboratory, in which it was attempted to get a method of registering the peristalsis of the stomach upon the kymograph. We used a deglutible apparatus which consisted of a very soft rubber bag having the shape of the stomach kymograph, which was passed into the stomach in the collapsed state and then blown up; so that it applied closely to the walls of the organ. In this manner the muscular contraction of the stomach, the impulse of the heart and the respiratory movements were registered through a writing apparatus connected with a manometer to which the œsophageal tube leading to the intragastric bag was attached. In one of two cases it was illustrated, beyond a doubt, that this intragastric bag had slipped into the

duodenum, which was evidenced not only by the length of the tube, but also by the fact that when the bag was blown up the stomach was not distended, the patient complaining of pain in the region of the gall-bladder by the distension.

From a large number of very accurate measurements on living and dead subjects, male and female, it has been found that the average length of the œsophagus, or rather the length from the incisors to the deepest part of the stomach, is 59 cm. The average length of the stomach in its longest direction is 18 to 22 centimeters. The greatest width is 7 to 8 cm. Under normal conditions, therefore, there is no physical reason why a tube cannot be passed into the duodenum, presuming that the tube does not kink or turn in the stomach, which it will unfortunately do. The œsophagus takes a nearly perpendicular course until near the bifurcation of the bronchi it begins its spiral turn, which brings it to the left of the aorta. In that region it has a very gradual swelling, so that it there assumes a spindle shape. About the level of the 10th thoracic vertebra the œsophagus begins to narrow down until its narrowest portion is reached, at what is called the hiatus. The foramen œsophageum is about 8 cm. behind the articulation which the sternal end of the tenth rib makes with the base of the ensiform cartilage. From this point the subphrenic portion of the œsophagus passes decidedly to the left, expanding in a funnel-shaped manner. This deviation causes a deflection of the tube. To avoid this deflection it occurred to me to fill the stomach with a rubber bag, the superior surface of which contains a groove running longitudinally. After the bag is inflated the tube is passed down and finds its way along the groove and enters the pylorus. Now the sphincter of the pylorus is not an absolute sphincter. The sphincter of the bladder will retain water, not so the pyloric sphincter. If you remember what little resistance the sphincter of the bladder offers to a soft rubber catheter, you will know about the amount of resistance which the pylorus will offer to the pressure of the œsophageal tube.

I am not prepared to speak of results as yet; I just want to give the technique of passing a tube into the duodenum. Of course it will be possible to obtain the duodenal secretions, the bile and pancreatic secretions, after fasting, and we will be able to test the digestion in the duodenum as we have hitherto been able to test the digestion in the stomach. Hitherto we have had no real evidence of duodenitis until jaundice has set in; all other evidence rests upon presumption. By this method we may get some direct evidence of catarrh of the duodenum before the common bile duct has been occluded by the swelling. The diagnosis of obstruction will certainly become more facilitated, and it will also be possible, by introducing a bag as far as it will go down in the duodenum, and closing it up, to wash out the duodenum, to inject water and get it out by aspiration. With this method it is possible to locate the duodenum quite accurately. It is possible to blow up the transverse colon and to distend the stomach with water or air, and as these organs are the only ones which can be confounded with the duodenum in the epigastric region, if we had a bag in the duodenum and could alternately fill the stomach and colon, we could then by alternate change of pitch locate first the stomach and then the duodenum exactly, by

filling the bag in it with water or air alternately. I have not made any tests as to whether electro-diaphany will be possible by passing the light into the duodenum. From recent observations of Prof. Roentgen, of Würzburg, on rays of light which pass through opaque bodies, it is not inconceivable that diaphany of the duodenum may be possible in the near future.

Dr. Kelly: My practical interest is entirely in endoscopic progress at the other end of the body. As I have had some questions to discuss relative to priority lately, I realize how important it is to get on record in time, so I will show you what I have done to meet Dr. Hemmeter.

Those of you who have been in my clinic have seen my proctoscope and sigmoidoscope in use. They have been very successfully employed in a number of cases in diagnosing and treating diseases of the whole of the rectum and a large part of the sigmoid.

The following case illustrates their use: A doctor in New York swallowed his teeth one night. They stayed in his stomach quite a while and then he felt them pass the pylorus; then they rested at the ileo-caecal valve for a long time. Then they were traced from the ileo-caecal valve to the sigmoid flexure, where they lodged. Here they could be felt by the doctor himself as well as by Dr. Wyeth. He came down to Baltimore to me one evening for an examination by my method, but as the rectum was too full of fecal matter for an examination at that time I ordered an active purge. The next day he came and I passed a long coloscope into the rectum, while he was in the knee-breast position; he felt the instrument strike his ribs and was well satisfied that he had passed the teeth during the night on account of the purge. I certainly found nothing abnormal.

The difficulty usually is that the expansion of the bowel ceases in the sigmoid. I now have an instrument in my operating room which is made to reach from the anus to the splenic flexure. The plan of construction is this: A long metal tube with a piece of glass in the proximal end has set in one side a small electric lamp which is connected with a storage battery. On the other side is an opening attached to a Davidson syringe with which the bowel can be inflated; under inflation we can follow the bowel up to the splenic flexure, and sometimes with a prism we can see around into the transverse colon.

NOTES ON NEW BOOKS.

Surgical Pathology and Therapeutics. By John Collins Warren, M. D., Professor of Surgery, Harvard University, Surgeon to the Massachusetts General Hospital. (*Philadelphia: W. B. Saunders.* 1895. 832 pp. 132 *illustrations, 4 colored plates.*)

There are two distinct tendencies observable in that wonderful wave of recent surgical progress of which we are so justly proud as a profession. One is the perfection of the technical part of our art, the improvement of methods of operation, the invention of new instruments, the elaboration of sutures and suture materials, and the extension of surgical procedures to every process of disease, from defective cerebral development to endocarditis. The other is the clearing-up of the origin and causes of surgical diseases, the less brilliant but more thoughtful study of processes by the bedside and in the laboratory, the linking together of diseases in a

coherent scheme, the investigation of the philosophy of pathological action and its relation to physiological. Both are necessary to progress, but the former alone produces the "mere operative surgeon," as one of our masters in surgery terms him, the instrument-inventor and namer, the "button-maker," the fee-collector; while upon the latter only can be based true progress, permanent and rational advances, broader knowledge and that nobler type of the surgical mind, that of the true fathers of the art, who are thinkers rather than operators, and philosophers as well as pathologists.

This book is both a product of and a valuable aid to the latter tendency. There is nothing spectacular or sensational about either its contents or its illustrations, but it is a clear, able, scholarly and absolutely impartial presentation and discussion of the latest facts and theories in the field which its title covers. We have seldom seen a more masterly review of the subjects, and our only criticism would be that the author sometimes leaves us in doubt as to which of the numerous theories of causation presented appears most reasonable to him personally. This is, of course, the true catholic, scientific spirit, and a most "virtuous vice," which is conspicuous by its absence in many of our professional treatises; yet we think that the reader is really entitled and would certainly prefer to know just what are the personal opinions of the writer himself, who has handled all the evidence at first hand, as it were, and is in every way better situated and better fitted to draw the true conclusions from the premises. This criticism, however, does not apply to the therapeutic treatment of each subject, which is a model of clear, concise, rational and yet highly practical suggestion and direction.

The illustrations are most excellent, nearly all of them colored or tinted original drawings from specimens or cases specially prepared or selected for the purpose, and preserving an admirable mean between the dress-parade exactness and milliner-like completeness of detail of many so-called "diagrammatic sketches," and the blurred or chaotic confusion of the what we cannot resist terming "mere brute photographs," which load the pompous pages of so many of our recent monographs and "Systems." We are just beginning to discover that the photographic camera is capable of giving as misleading and even absolutely false impressions of structure as its imitator, the self-styled "Realist," does of human nature. These drawings are made in the true artistic spirit, gently emphasizing and calling attention to the elements of the picture which are of greatest importance from the point of view of the observer, without sacrificing the truthfulness of the whole in so much as a single line. Our only criticism takes the form of a regret that they are not more numerous.

We regret that space forbids a criticism of the various chapters in detail, but so many are the subjects handled and so interesting the problems presented that it would be impossible to decide where to stop. The work opens with two excellent, clearly and simply written chapters upon Bacteriology and Surgical Bacteria, in which we are glad to say that due credit is given to the powers of resistance possessed by the fixed cells of the body against these little pirates. Then follow six chapters upon that most important but most appalling subject, Inflammation. This is very thoroughly and interestingly discussed in all its forms, both simple and infective, and the numerous chapters deservedly devoted to it form one of the most valuable sections of the book. We regret, however, to find that his next chapter, discussing the Process of Repair, takes the ground that "the two processes (repair and inflammation) are quite independent of each other." It is, of course, largely a matter of terms, but we think the more philosophic view is to regard one as simply an excess or extreme of the other. Both are essentially a rapid "feeding up" of the fixed cells of the region to enable them to breed and fill the gaps in their fighting-line which are temporarily bridged by the leucocytes. Gangrene is next consid-

ered and the important practical reminder given that compresses wet with strong solutions of carbolic acid will alone produce gangrene of fingers or toes, so that this antiseptic should be used with great caution in cases having this tendency.

The Causation of Shock is most elaborately and ably discussed, the theory regarded with most favor being that of acute and profound fatigue or exhaustion of the nerve-centres of the cord and medulla, after violent and destructive stimulation. On the causation of fever our author seems inclined to accept the views of MacAlister and Rosenthal, that it is produced by the thermogenetic action of the muscle-cells and consists mainly of diminished heat-loss, rather than of increased heat-production. In regard to Surgical Fevers he takes a decided stand against the extremists who declare that every rise of temperature after an operation means some degree of septic infection, and describes two forms of "aseptic fever," one, the atypical "traumatic" fever of nervous origin, and the other of more definite and prolonged type, due to the absorption of various pyrogenous substances and ferments from breaking-down blood clots or shreds of tissue. The latter form has recently been found to quite frequently occur after severe contusions with ecchymosis but without any break of the epidermis.

The General Surgical Diseases come next in order and are closed by Hydrophobia, Anthrax and Snake Bite.

The chapter upon Hydrophobia is of a length which appears somewhat disproportionate to the real importance and frequency of the disease, and the statistics given show, as do all genuine ones upon this subject, that remarkable discrepancy which none of the believers in this extraordinary and mysterious malady have been able to explain, between the number of cases occurring per annum in Europe and elsewhere before the exploitation of Pasteur's inoculation cure and since. For instance, the deaths in New York from this disease numbered 76 in 35 years, or an average of 2.18 per annum; while the deaths in Paris at the Pasteur Institute from 1885–1893, eight years, were 72, or 9 per annum, which are the "failures" of inoculations upon no less than 14,430 cases, more than had occurred in any century before in all Europe. The discovery of the "cure" evidently came only just in time to prevent the depopulation of the continent by the disease.

The chapter upon Snake-bite is written too much from an Oriental standpoint and takes the subject much too seriously, so to speak, for an American text-book. The comparative rarity of fatal results in an adult after rattlesnake-bite is not even mentioned, and the "*post hoc ergo propter hoc*" value of whiskey as an antidote is distinctly, though guardedly, endorsed. That "severe prostration" should suddenly appear in these cases "after an interval of a few minutes or of hours" is not surprising in view of the fact that from three to six pints of raw whiskey may have been administered in the meantime.

The prominent part played by Tuberculosis in surgical pathology is adequately recognized in the able and exhaustive discussion of its various forms, covering nearly 100 pages. Hygroma or "Ganglion" is here placed where it belongs, but the section on Lupus is somewhat confused and adheres to the old classification, now nearly abandoned by dermatologists, into "ulcerating" and "non-ulcerating" forms of the disease. The ancient term of "Lupus exedens" is also retained, and it is spoken of as attacking the periosteum, while the process itself (lcrativeulcer and named is known to be "flat-celled" carcinoma ("robust ulcer") and not a "lupus" of any sort.

The view taken of the likelihood of systemic infection from tuberculosis of the testicle is much more hopeful than that usually held, but seems warranted by the evidence adduced.

The treatment of Carcinoma is thoroughly modern and comprehensive and the classification admirably simple and rational. The questions of its parasitic origin and infectiousness are well discussed in a most judicial spirit, ending with the Scotch verdict of "not

proven." The therapeusis is, of course, strictly operative, although both Moorhof's pyoktamin injections and Coley's strepto-prodigiosus inoculations are described as last resorts. The latter method is characterized as useless in cancer, and even in sarcoma, it is remarked, "the experience of many prominent surgeons with this method has not been satisfactory."

The book closes with a capital chapter upon Aseptic and Antiseptic Surgery, and a short appendix is added containing laboratory directions for the preparation of certain "*heil-serums*," as the Germans most happily term them, and for preparing tissues for examination.

Take it altogether, it is a decided advance upon any other American text-book upon this subject, and for concise thoroughness, grasp of subject and readableness one of the best in the language and of special value to the busy practitioner.   W. H.

Burdett's Hospital and Charities Annual and Year Book of Philanthropy for 1895. Edited by HENRY C. BURDETT, author of "Hospitals and Asylums of the World"; "Cottage Hospitals: General, Fever, and Convalescent." (*London : The Scientific Press Limited; New York : C. Scribner & Sons*, 1895.)

In a previous volume of the BULLETIN we had occasion to commend the excellence and great usefulness of the Annual for 1894. The contents of the present Annual are more complete and varied than last year, and the range of usefulness of the book is correspondingly increased. In addition to the full list of names of hospitals, asylums and training schools throughout the world, and of missionary and religious societies, orphanages, homes, refuges, etc. in England, there are interesting discussions of many topics of vital interest to all engaged in charitable and philanthropic work. An effort, for example, is made to show what the actual cost of each patient under treatment in hospitals is and should be, a task of extreme difficulty and magnitude when the complicated character of the factors entering into the question of cost is considered. The necessity of a uniform system of hospital accounts for purposes of comparison is once more urged with increasing cogency and vigor. The editor again emphasizes the statement that excessive cost does not necessarily indicate great results, and points out the moral responsibility of all engaged in hospital work, to do that work as economically as is consistent with good results, and to demonstrate by figures the superiority of their work. The utility of Hospital Saturday and Sunday is also very clearly shown by its effect to produce better financial methods. Hospital Saturday and Sunday, by the way, have made little substantial progress in America, and the movement seems to be losing rather than gaining force. It is already evident that America is not yet ready for it, and until an interest in hospitals and hospital work becomes widespread in every city, it will not succeed here as it has succeeded in England. A permanent popular movement to help hospitals must have its roots in an autochthonous, self-developed sentiment. Strangers, misled by the imitative, quickly responsive character of the American people, fancy that because some novel scheme which has been successful in England is eagerly taken up here, its success is assured. Such enterprises, in the majority of instances, fail because of the lack of a real sentiment behind them. Hospital Saturday and Sunday cannot succeed here until an interest in hospital work becomes universal and pervades every class of society. The apparent apathy in the movement to create a pension fund for nurses has a similar origin. The scheme cannot hope to succeed until it is developed from our own hospital and training school system. We must develop our own institutions or modify pre-existing ones to make them conform to our social and economic conditions.

For a similar reason it is to be feared that Mr. Burdett's hope of an international system of hospital accounts will prove an *ignis fatuus*. Those who have seriously studied his little book, "The Uniform System of Accounts for Hospitals and Public Institutions," with the hope of adopting his system in the United States, will

appreciate the difficulties of the task. Many of his items of expenditure are unintelligible to an American, and his ledger headings almost meaningless.

The Annual is of the highest value to all hospital workers and managers the world over, and should be widely read.   H.

Pregnancy, Labor and the Puerperal State. By EGBERT H. GRANDIN, M. D., and GEORGE W. JARMAN, M. D., illustrated with forty-one (41) original full-page photographic plates from nature. Royal octavo, pp. viii, 261. Cloth, $2.50 net. (*Philadelphia : The F. A. Davis Co., Publishers.*)

One rarely meets with a book which offers so slight a claim for commendation and so great a need for criticism as does the volume before us.

It presents throughout marked evidences of haste in its preparation, which is shown by the omission of many important details and the style in which it is written.

One can scarcely read a page without meeting with phrases or expressions which violate every rule of good diction. For example, we find such a sentence as the following, page 82: "Under circumstances when deep palpation is not impossible, owing to *great adipose* in the abdominal wall, or excessive amount of liquor amnii," etc. We also find a normal, uncomplicated labor or puerperium described as "smooth," and numerous similar expressions.

There is nothing in the text which is not found in the usual textbooks on obstetrics, and apparently its chief claim for existence is based upon the fact that it is "illustrated with forty-one (41) original full-page photographic plates from nature." Some of the plates are really good; the majority either show nothing or are entirely superfluous; while a considerable number give evidence that the authors could not resist the temptation which appears to assail so many at the present time, of exhibiting their likenesses as often as possible to a long-suffering profession.

Actual count shows that at least 21 out of the 41 plates are practically useless. For example, Plate 8 gives a cabinet likeness of a woman suffering from "melancholia of pregnancy." Plates 15, 16, 17 and 18 are full-page illustrations representing one of the authors auscultating the fœtal heart in the various presentations of the fœtus. Plate 27 presents the instructive sight of an assistant wiping off the vestibule with a piece of cotton previous to catheterizing the patient! Plate 33 represents the authors and two assistants "clamping the cord and cutting between the clamps." Finally in Plate 38 we are edified by seeing the authors and three assistants "washing the eyes of the fœtus immediately after delivery." Lack of space forbids a criticism of the illustrations in detail, but the few which have been mentioned will serve to represent the character of many others.

In conclusion we would express our surprise that two such able men as the authors should unite to produce so poor a work.

                              J. WHITRIDGE WILLIAMS.

A Practical Treatise on Materia Medica and Therapeutics, with Especial Reference to the Clinical Application of Drugs. By JOHN V. SHOEMAKER, M. D., LL. D. Third edition, thoroughly revised, 1108 pages. (*The F. A. Davis Co., Philadelphia*, 1895.)

An increasing interest in pharmacology in Europe during the last few years is shown in the appearance there of a number of excellent works, while in America few really scientific text-books have as yet appeared. Those furnished us belong mostly to the class of empirical works, dealing almost entirely with therapeutics, and lacking real *a priori* explanations.

The work before us is a representative of this class. The author does not state whether he wishes his work to be considered a text-book for students or an encyclopædia. If the first, the alphabetical classification is very unfortunate, and its size, 1108 pages, interferes with its usefulness.

The sections on the physiological action of the various drugs are

far from satisfactory. There are few, if any, chemical formulæ to render clear the relation of the various compounds and their decomposition-products. No effort is made to handle the question of synthetic productions.

Many of the author's expressions are vague, *e. g.*, in speaking of alcohol he says it is "burnt up in the blood," an expression which without further explanation may be very misleading.

Again the metric system has hardly received full attention, although it is now the standard among pharmacists.

Many statements are given which hardly coincide with recent pharmacological experimentation, *e. g.*, as treatment for poisoning by male fern the author recommends the administration of castor oil. Now we know from the experiments of Poulssen that castor oil is an excellent solvent for the active principle of male fern and renders it more capable of absorption, and thereby intensifies its toxic action. Again the hypodermatic use of alcohol is recommended in chloroform syncope—a most questionable procedure. The entire discussion of the alcohol question is made to rest on the formerly current view of its stimulating action, which the author neglects to state is due to its local irritating effects.

While quoting Tauber's and Alt's experiments on the elimination of morphia, the author fails to properly apply their results clinically, for in speaking of the treatment of opium intoxication he recommends merely washing out of the stomach and says nothing of repeated washings.

Other statements, as, for example, his explanation of the myotic action of physostigmine, etc., may be criticised.

There is also much to be desired in the manner of presenting facts. It often seems more a question of stating many facts than of trying to interpret them, for example, in considering the action of cocaine on the eye mention is merely made that it causes mydriasis, etc., but gives no explanation as to the manner of its production. The same could be urged against the discussion of belladonna.

The references to original literature are very incomplete.

While the instances cited above are examples of the weakness of the treatise from a pharmacological point of view, the author has nevertheless rendered accessible many valuable formulæ and clinical suggestions, and for this reason the work will prove useful.

A. C. C.

An American Text-book of Obstetrics for Practitioners and Students. RICHARD C. NORRIS, M. D., Editor; ROBERT L. DICKINSON, M. D., Art Editor. 1009 pages. (*W. B. Saunders, Philadelphia*, 1895.)

Considered as a whole, the work is a very good one, and possesses as few faults as possible for a work of heterogeneous authorship. We feel confident that it will be very useful to the busy practitioner, who is pressed for time and is unable to read the current French and German obstetrical literature, as it offers an excellent resumé of the more recent advances in obstetrics throughout the world.

The work is profusely illustrated ; many of the illustrations are original and improve greatly on those usually found in text-books.

The chapters on the anatomy of the generative organs and the physiology of pregnancy, which are contributed by Piersol, are the best with which we are familiar in English and leave very little to be desired. The only criticism which we would make upon his work is that he has practically based all his embryology upon that of the chick, instead of the recent work of Graf Spee, Selenka and Mall upon the monkey and man.

We would also commend the clear manner in which Dickinson has treated the complicated question of the lower uterine segment.

Jewett's chapter upon the conduct of normal labor is, likewise, to be commended, especially the portion in which he considers the question of asepsis and hand disinfection. It is the only chapter in the American text-books which are usually recommended to students which gives this most important subject anything like the attention it deserves.

The chapters of Reynolds on the mechanism of labor, and Garrigues on puerperal infection, are also deserving of praise.

The work is, of course, not perfect, and numerous mistakes and inaccuracies may be discovered ; but taken all in all, it is a valuable work, and a very great improvement on its sister work, the American Text-book of Gynaecology.

J. WHITRIDGE WILLIAMS.

Diet in Sickness and in Health. By Mrs. ERNEST HART, with an Introduction by Sir HENRY THOMPSON, F. R. C. S., M. B., London. (*London : The Scientific Press, Limited. Philadelphia: W. B. Saunders,* 1895.)

This admirable volume of about two hundred pages should be in the hands of every nurse and practitioner. It is written in a clear style and, without any sacrifice of scientific precision, is intelligible to the lay reader. The accomplished author has drawn largely upon her own experience in some of the chapters, and the book consequently has a personality and individuality which undoubtedly add to its interest. The chapters on "food and food values," "stimulants" and "digestion" are probably of most value to lay readers, while the chapters relating to special dietaries for different diseases as diabetes, gout, typhoid fever, etc., will probably commend themselves most to the nurse and medical man. The directions given for special dietaries seem clear and concise and, best of all, the articles recommended are obtainable. The Introduction by Sir Henry Thompson has no value except as an advertisement, and the book would be better without it. The book itself is worthy of high commendation. It should be studied in every nurses' training school.

BOOKS RECEIVED.

Real-Encyclopädie der gesammten Heilkunde. Medicinisch-chirurgisches Handwörterbuch für praktische Aerzte. Herausgegeben von Prof. Dr. A. Eulenburg. 3 gänzlich umgearbeitete Auflage. 9. Band. Gehirnnerven-Haschisch. 1896. 8vo. 667 pages. Urban und Schwarzenberg, Wien und Leipzig.

Diagnosis and Treatment of Diseases of the Rectum, Anus and Contiguous Textures. Designed for practitioners and students. By S. G. Gant, M. D. With two chapters on "Cancer" and "Colotomy" by H. W. Allingham, F. R. C. S. Eng. 1896. 8vo. 399 pages. The F. A. Davis Co., Phila.

A Text-Book upon the Pathogenic Bacteria. For students of medicine and physicians. By J. McFarland, M. D. 1896. 8vo. 359 pages. W. B. Saunders, Phila.

Text-book of General Pathology and Pathological Anatomy. By R. Thoma. Translated by A. Bruce, M. A., M. D., F. R. C. P. E., F. R. C. S. E. Vol. I. 1896. 4to. 624 pages. A. & C. Black, London.

Color-Vision and Color-Blindness. A practical manual for railroad surgeons. By J. E. Jennings, M. D. 1896. 8vo. 115 pages. The F. A. Davis Co., Phila.

United States. Department of the Interior, Census Office. Eleventh Census, 1890. 15 v. 8vo. Government Printing Office. Washington, D. C.

United States. Department of the Interior. .... Government Printing Office, Washington, D. C.

Students' Quiz Compend No. 18. Essentials of Practical Pharmacy. Arranged in the form of questions and answers, prepared especially for pharmaceutical students. 2d ed., revised. By L. E. Sayre, Ph. G. 1894. 12mo. 200 pages. W. B. Saunders, Phila.

Elementary Electro-Technical Series. Electricity in the Household and its Applications. By E. J. Houston, Ph. D., and A. E. Kennelly, Sc. D. 1896. 12mo. 167 pages. The W. J. Johnston Co., New York.

Diets for Infants and Children in Health and in Disease. By Louis Starr, M. D. 1896. 16mo. W. B. Saunders, Philadelphia.

PUBLICATIONS OF THE JOHNS HOPKINS HOSPITAL.

THE JOHNS HOPKINS HOSPITAL REPORTS.

VOLUME I. This volume is now in press. It will contain the studies from the Pathological Laboratory. It will be edited by Dr. W. H. Welch, Professor of Pathology and Pathologist to the Hospital.

VOLUME II includes 570 pages, with 28 plates and figures. Price, bound in cloth, $5.00. It contains:

Report in Medicine, I.

I. On Fever of Hepatic Origin, particularly the Intermittent Pyrexia associated with Gall Stones. By WILLIAM OSLER, M. D.
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CONTENTS.

THE ANATOMICAL COURSE AND LABORATORY OF THE JOHNS HOPKINS UNIVERSITY.

BY FRANKLIN P. MALL, *Professor of Anatomy, Johns Hopkins University.*

Three years have now passed since the teaching of anatomy was begun at the Johns Hopkins University. A number of radical changes were introduced into the course, and during the first year a new anatomical laboratory was constructed. The methods of teaching, as well as the laboratory, I believe to be a success and therefore make the following publication.

The literature on the construction of anatomical laboratories is extremely brief. Descriptions of some of the European institutions have been published in detail, and I have found that by His* the most valuable. He describes a carefully planned building accurately, giving aims and ideals as well as difficulties to be overcome. In America we cannot boast of the multitude of buildings erected especially for the teaching of anatomy and investigation in this subject. This lack is to be the more regretted because we have many problems peculiar to this country. Our students and our climate are both unlike those in Europe, and yet in our many medical colleges the most fundamental branch in medical science is treated in a very shameful way. The dissecting room is as a rule poor, while the laboratory facilities for microscopical study are usually wanting altogether. A few of our leading institutions are marked exceptions to the above statement.

The object of the laboratory is to teach students, to train investigators, and to investigate. Although the first mentioned requires the greater portion of the instructor's time, its importance is by no means as great as the second and third. A subject like anatomy, taught for many centuries, has recently been made a new science through the studies in embryology and histology. The studies in embryology have gradually become more and more comparative in nature, and in turn have influenced to a very great extent our conceptions of comparative anatomy. The great influence of histology is not yet fully felt outside of the study of the higher animals, but its importance has been shown over and over again in the branches fundamental to medicine.

The laboratory method of instruction has become very firmly established in many of our colleges in their undergraduate courses, but in medicine the *results* are yet taught to a great extent by means of lectures. Our problem is the study of the structure and the development of the parts of the human body, utilizing all the methods at our disposal to instill these facts into the student's mind. The aim is to make the course one continuous problem for each student to investigate, aiding each one with good material, and teaching him how to study, wherever necessary.

The instructor soon learns the value of investigation, even in the dissecting room, and with this ideal constantly in view, he soon imparts a portion of it to his students. When anatomy is studied in this way, the student must indeed be stupid not to discover the many defects as well as errors in some of our favorite English text-books.

No subject has been taught more carefully nor in greater detail than anatomy. It has been taught by the greatest minds, and has been presented by means of painting and

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* His, Zeit. f. Anatomie, Bd. II, 1877.

engraving ever since these arts have been invented. Yet in looking over the history of men like Vesalius and John Hunter, one is struck with the fact that they taught it from the human body. They had their battles to fight and even to risk their lives to procure human bodies for dissection. They had to antagonize the prejudice against dissection at that time, as many of us in America must to-day.

But with all the good examples shown us by our great predecessors, the tendency has been to teach more and more by means of lectures; and although dissection has grown very popular, it is usually done very poorly and sometimes not at all. In Europe the lecture courses have, in many universities, become gigantic in extent, and the only thing which can stop any of them is a total lack of students.

I have asked many professors, even of anatomy, where they had learned their anatomy, and in nearly all cases the reply was "in the dissecting room." They all admitted that in addition to demonstrations, lectures were of little use to students, and some believed them worse than useless. The zoölogists and botanists have long ago learned the absurdity of the lecture method of teaching, but the anatomist patiently keeps up this slow and stupid method of instruction. It is stupid because no anatomist would use this same method if he were to learn instead of to teach.

We know very well that the burden of responsibility is removed, to a great extent, if the instructor goes over the whole subject carefully once a year. He then can tell his student to go to the dissecting room to see for himself. If the student does not attend the lectures, the professor carries no responsibility, no matter how uninteresting or uninstructive they may be. Yet the beauty of the courses of lectures is that the professor carries no responsibility if the student does not know his anatomy.

I believe that there is but one way to learn any subject, and that is through study. The very name *student* tells what the person so named should be doing; and with a natural science, dealing with a most complex object, extending through the three dimensions of space, any other method besides studying the object itself is practically useless.

Lectures with demonstrations are certainly valuable—more valuable than the lectures with text-books alone. Yet analyzing the object itself is infinitely more valuable than to watch the results exposed by another. Wrestling with the part which is being studied, handling it and viewing it from all sides, and tabulating and classifying the parts worked out, give us the greatest reward. All this may be accomplished by practical laboratory work. If we can make the student work thoughtfully and carefully, a great result is achieved. It makes of him an artist, an actor, an expert, not a dilettant. He is upon the stage, not in the audience.

If, now, all the energy which is expended in conducting extensive lectures is employed in managing a dissecting room, we will find to our astonishment that this ideal can be reached in a certain number of cases. It is not difficult to keep account of the many details of the work, for there are many people in business who easily manage much greater accounts with precision. So this difficulty must be placed aside as one easily overcome. In our laboratory we can tell, though asked

at almost any time, what any of the 70 students have done during the year. Also we can give the complete history of any of the subjects dissected. For instance, in Subject No. 70 the first lumbar nerve arose in such-and-such a way and was distributed through the branches to certain regions. It was dissected by Mr. Smith during a certain month. There were in this subject 24 vertebræ; it was white; a male, about 50 years old; was embalmed with carbolic acid and had been in cold storage for 15 months, etc. Mr. Smith's dissection was excellent, good, indifferent, or bad; his knowledge of the subject was also excellent, good, indifferent, or bad; he dissected certain parts poorly, others well, and so on. These records are all kept by the various instructors and are finally recorded upon cards, each representing the part dissected. This method is carried through for osteology, histology, neurology, and embryology, and finally, when the student appears for examination, we have his complete record before us.

In arranging the course on anatomy at this University, very great stress was laid upon the microscopical work. Although this course is conducted separately and independently of that in gross anatomy, they are, however, adjusted to each other in every respect. Much of the advance in modern anatomy is due to the microscope, and we believe that if an anatomical course is robbed of this sub-department it loses its most important support.

In many of the medical institutions of this country, histology is not in charge of the department of anatomy, and often is not represented at all, or at best by too brief a course.

In Europe, histology is often an independent department (as in Austria), or it is frequently subordinate to physiology. There is no harm whatever in giving a histological course in departments other than anatomy, but anatomy must not be robbed of its privilege of conducting such a course. Histology has found its home principally in Germany, and in that country every anatomical institute has associated with it histology.[*] Waldeyer says that anatomical instruction and research should be carried on as far as possible with the naked eye and then continued with the microscope.[†] This has been our ideal in the planning of our course and in the construction of our laboratory. When a course is conducted in this way it requires much space, extensive apparatus and a large number of instructors. In Leipzig much space is saved in utilizing the same room for both courses: anatomy in the winter and histology in the summer.[‡] This gives an abundance of room for microscopical work, for in all cases more space is required for the course in gross anatomy than for histology. In the Leipzig laboratory a special room containing a floor space of 114 square metres had been constructed for histology, but it was found to be too small, and the course had to be transferred to the large dissecting room, which contains 210 square metres floor space. In Berlin 200 students must be accommodated, and two parallel courses are given in a room containing 153 square

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* See Waldeyer in Die Deutschen Universitäten (Report to the University Exhibit at Chicago, 1893), Berlin, 1893, Bd. II.

† Waldeyer, Wie soll Man Anatomie lehren und lehrnen, Berlin, 1884.

‡ His, Zeitschrift für Anatomie und Entwicklungsgeschichte, 1877.

metres of floor space.* But Waldeyer deplores the fact that they are cramped in space, which is a very serious difficulty.

Our histological laboratory has an area of 150 square metres, and is intended to accommodate 50, or at the highest 60 students. If necessary other rooms may be used for the same purpose, which will enable us to instruct a much greater number in histology. Each student is supplied with a working place and locker, containing in addition to Leitz microscope II with Abbe condenser, a suitable dissecting microscope. All the necessary reagents are obtained in the labora-

projection of specimens are employed whenever necessary. In a general way we dissect as far as possible in the dissecting room, and continue with the microscope in the histological laboratory.

During the first year a practical course was given in the embryology of the chick, but it was found unnecessary to continue this with many of the students, as most of them have had an extensive course on embryology before they begin the study of medicine. However, embryology is alluded to frequently in our courses in practical anatomy and histology,

ATTIC PLAN

N.

Feet 0. 5. 10. 15. 20. 25. 30.

Metres 0. 1. 2. 3. 4. 5. 6. 7. 8. 9.
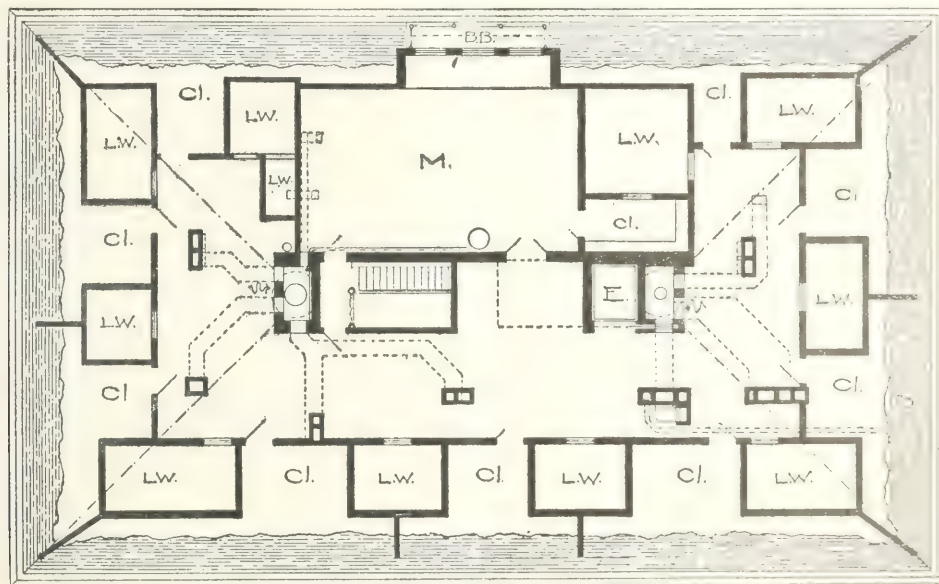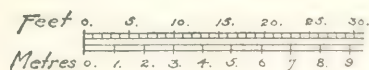
FIG. 13.

M, Macerating room. LW, Light well. Cl, Closets. E, Elevators. BB, Bleaching balcony.
The dotted rectangle as well as the square over the stairs mark the light wells in the central portion of the building.

tory. The course extends through 15 hours each week, from October 1 to March 15, but most students do some work during odd hours, as the laboratory is open all day.

The aim, throughout the course, is to begin with the fresh tissues, and to end ultimately with many of the complex methods in demonstrating the structure of difficult organs, like the brain. Suitable charts, models, dissections as well as

and each organ is also presented from the standpoint of histogenesis.

Our laboratory has been designed especially to meet out our ideals, and during its construction we have constantly kept before us the following points:

Light.

Heat and ventilation.

Basement: planned to manage heat and handle reception of anatomical material.

Cold storage and embalming rooms.

First floor, lecture room, etc.

Second floor for histology, which was planned in connection with the work on anatomy.

Photography, dark room for reconstruction, chart-making, etc.

Research and preparation room. Private rooms.

Third floor to contain a multitude of dissecting rooms, each complete in itself.

A study room.

Models displayed in the rooms when needed.

Suitable lockers and rooms for the use of students.

shaft, in which are placed the stairs and the elevator (see Fig. 13). This gives an abundance of light for the stairs and the upper floors, but we did not trust to this light alone for the illumination of the halls. There are about as many windows as possible in the building. They are wide, and reach nearly to the ceiling, thus giving ample side light for each room. The large rooms on the north side receive light from all three sides, thus making it possible to work with the microscope in any part of the room. Over each door entering the hall there are large transom windows, which aid in the illumination of the halls. On the first floor the hall is illuminated with a special

THIRD FLOOR PLAN

Feet 0   5   10   15   20   25

Metres 0. 1. 2. 3. 4. 5. 6. 7. 8.
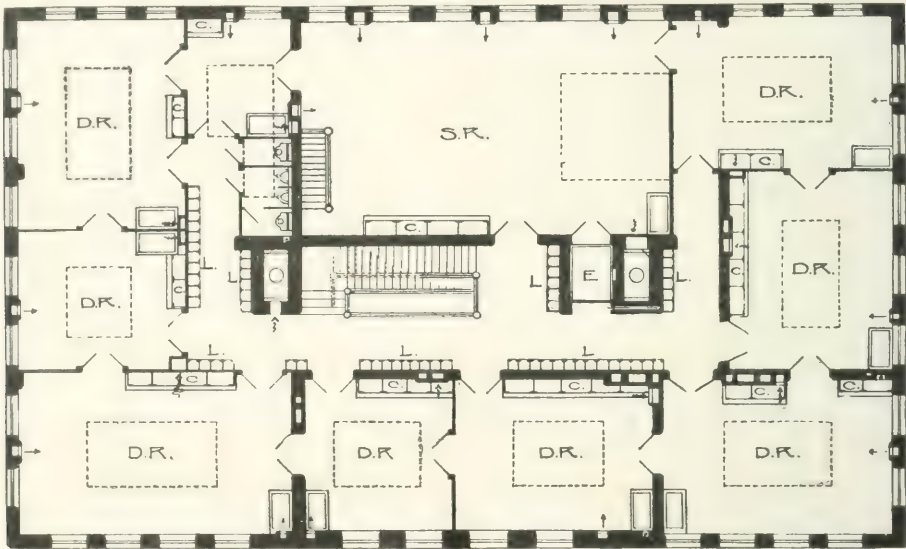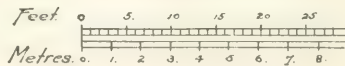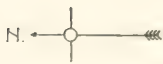
Fig. 10.

DR. Dissecting room. *SR*, Study room. *C*, Cases. *L*, Lockers. *E*, Elevators.
The dotted rectangles around *DR* indicate the extent of the light wells. The lighter partitions indicate that the walls are thin and can be removed easily.

An abundance of storerooms. Storeroom for combustibles.

Animal house and aquaria.

Bone room.

Light.—The great majority of laboratories are very poorly lighted, and this is a very serious defect. In many of the American medical colleges the dissecting room is on the top floor, with an additional skylight. This is a most superior method of illumination, and we have adopted it not only in this laboratory but also in the pathological.

First and foremost in the building is a great central light

window, thus giving all of the halls throughout the building splendid light.

Each room on the third floor has, in addition to this abundance of side light, a large skylight (see Figs. 10 and 13). The rooms are protected from the cold by a special layer of glass on the level with the ceiling. These light shafts communicate with the attic floor by means of windows, which give additional light to this floor, and give an entrance to this shaft from the inside of the building to clean the skylights.

The balcony on the fourth floor connects with the fire escapes as well as with the roof, so it is possible to go to any portion of the building as well as through the ventilating shafts without constructing any scaffolding or breaking any of the walls.

Heat and Ventilation.—The heating and ventilating systems of the building are very perfect. Cold air, obtained through the windows of the basement, is heated by means of steam

The ventilating system is by means of two large central shafts, which grow larger and larger as the top of the building is reached, to make room for the additional air entering the shafts from the upper floors. In the center of the north shaft is the smokestack, and in the other the steam exhaust from the engine. In addition to these pipes there is a steam coil in each shaft which aids to heat the air in the shaft,
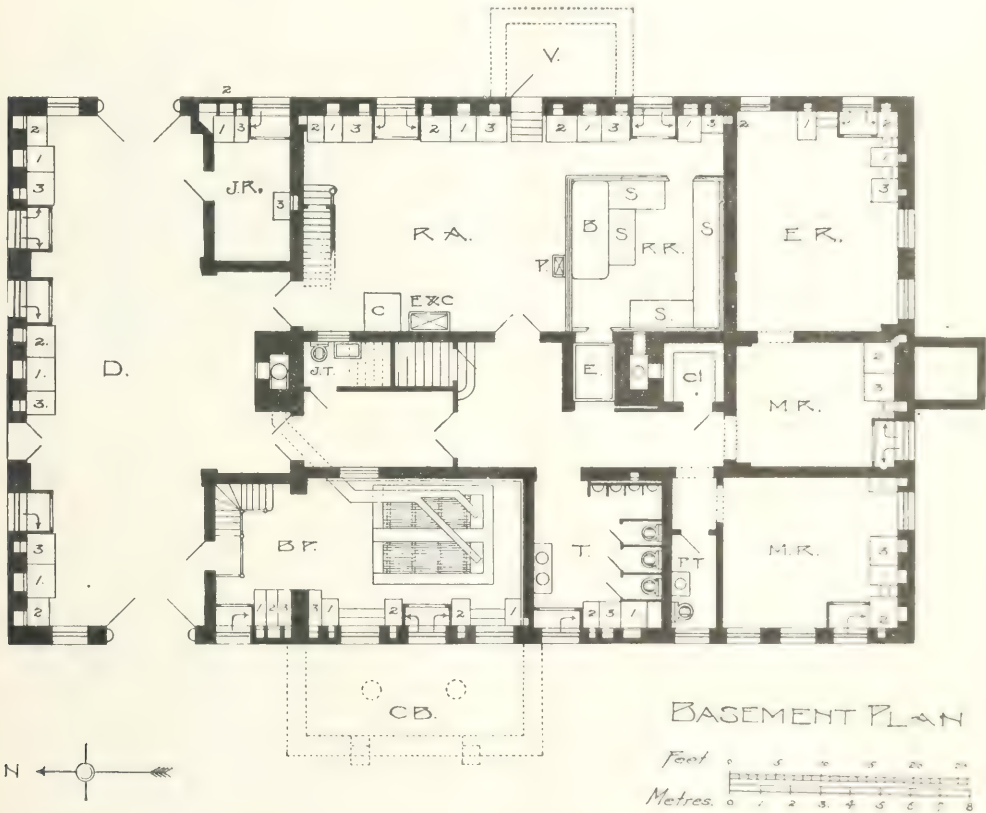
FIG. 1.

D, Driveway. RA, Refrigerating apparatus. C, Condenser. E & C, Engine and compressor. P, Pump. S, Brine tank. RR, Refrigerating room. S, Shelves. ER, Embalming room. MR, Machine room. BR, Boiler pit. T, Toilet. PT, Private toilet. E, Elevator. Cl, Closet. JT, Janitor's toilet. JR, Storage room. V, Chemical vault. CB, Coal bins.

The figures 1, 2 and 3 in the boxes communicating with the hot-air shafts indicate that the shafts communicate with the first, second and third floors respectively.

coils and then allowed to pass to the rooms through shafts in the outside walls. The Arabic figures in the Basement Plan indicate the floors with which the shafts communicate, 1, to the first floor, and so on. Each room in the building has its own hot-air shaft, and in no case does one shaft go to two stories. There is an abundance of heat, which can be cut off from the room or from the basement, as will be described further on (see Fig. 1).

making a constant upward current of air (see various Ground Plans).

In all cases the communication with the shaft is near the floor of the room and on the side of the room opposite the entrance of warm air. The ventilating registers of the larger rooms near the shaft enter it directly, while those somewhat distant pass up the partition walls and communicate with the shaft immediately below the roof (see Fig. 13).

During two years' experience we have never had gases or odors to enter the shaft and to come out again on the floor above or below, as the suction force of the shaft is sufficient to carry everything entering it to the outside of the building.

The macerating room as well as all of the closets have their own special ventilating shafts communicating with the roof, as the laws of Maryland prevent their being connected with the main shaft.

The elaboration of the building was made by Mr. Archer,* and that of the heating system by Mr. Newton of the firm of Bartlett, Hayward & Co.† I am under obligations to Mr. Archer for the interest he has taken in our problem, as well as the willingness he has shown in adopting plans to overcome our difficulties.

The Basement.—The basement is partly above ground on the south, and wholly above ground on the north side. Its plan is shown in Fig. 1. On the north side there is a drive, *D*, through the whole building, which facilitates the handling of bulky apparatus as well as the reception of anatomical material. This drive is one of the most practical arrangements of the whole building. Very close to the drive is a sub-basement containing the boilers, *BP*. Communicating with the boiler pit is an arched vault, *CB*, extending below the sidewalk, which can be filled with fuel from the street. A hall extends through the basement, and from this the elevator, *E*, communicates with all the floors above. In addition to this there are the embalming room *ER*, the engine room *RA*, storage rooms *JR* and *CL*, cold storage vault *RR*, chemical vault *V*, machine shops *MR*, and toilet rooms *T*. The dark parts of the basement and the vaults are illuminated with electric light.

The whole system of heating, as well as the hot and cold water pipes and drainage, are all exposed in the basement. Nothing is buried and out of reach. A certain number of windows are utilized to obtain the air from the outside, by boxing them off with a large second window. This space communicates by means of large shafts with the sheet-iron boxes containing the steam coils. From these boxes the hot air passes through the hot air shafts to the various floors above, as indicated by the figures 1, 2 and 3. Each room is heated with its own shaft, and each shaft has its own hot air box. The circulation of hot air can be regulated from the room above as from the hot air shaft below. Moreover, the steam for any shaft or set of shafts can be cut off by closing the valve of the steam pipe passing to the respective hot air boxes

There are two boilers, either or both of which may be run at high or low pressure without interfering with the heating apparatus. Whenever it is necessary to operate the engine it is necessary to run at least one boiler at high pressure. The capacity of the boilers and engine is sufficiently large to operate any machinery we may need in future.

The garbage of the building is all cremated in the basement.

The Preservation of Anatomical Material.—The supply of anatomical material for dissection and the laws regulating it in Maryland are such that it influences materially the plan of our course in anatomy. Not only is the material scarce, but our most abundant supply is obtained during the summer months when the weather is extremely warm. These facts compel us to resort to rigid methods in its preservation as well as in its dissection.

We have tried a great variety of methods to embalm bodies and find none more excellent than the carbolic acid mixtures. Even the formaldehyde solutions appear to be inferior to it. I prefer to use enough carbolic acid to coagulate all of the muscles, as this destroys the odors completely, and then the parts will not decompose while they are being dissected. This is accomplished with about one kilogram of the pure acid diluted sufficiently with alcohol and glycerin. It is well to mix them in thirds, or in the ratio of one of acid to two of glycerin and two of alcohol. Simply injecting this fluid into a large artery with a syringe by no means sends the fluid to all parts of the body in every case. It is necessary to inject it gradually under a constant pressure. In our laboratory we have a constant pressure apparatus in the embalming room, which can be regulated with ease up to two atmospheres (Fig. 2). About 5 to 7 lbs. to the inch pressure are usually sufficient to distend all the arteries of the body thoroughly. With this pressure about 4 to 6 quarts of the fluid is gradually forced into the femoral artery. A double cannula is employed, injecting both the peripheral and central ends at the same time. It is easy to tell by the appearance of the skin when the body is well injected. The coagulation in the skin about the neck and arms usually appears first, then the face, and finally that of the leg opposite the one in which the femoral has been cut. These marks indicate that the deeper parts have been well injected.

The body is now allowed to remain in the room for from 12 to 24 hours, when the second injection is made to color the arteries. I have never fully understood why the Europeans have had such difficulty in filling the arteries to their satisfaction for the dissection room. I find plaster of Paris colored with red lead eminently satisfactory; it is easily handled and never flows from a cut vessel. We inject a *very* fluid plaster colored with red lead under a high pressure (about 10 lb. to the square inch). Two quarts of this fluid will flow into the arteries in the course of a minute or two, and then it is immediately allowed to flow out. This procedure distends all of the small arteries and leaves practically no plaster in the large vessels, for the plaster remains in the small arteries but flows out again from the large ones.

Subjects treated in the above-mentioned manner can be kept for a long time in almost any fluid, and also in an ordinary ice-box (40° F.). I have kept them in the latter for over a year, but there is a tendency for the feet and hands to mould. These are not perfect methods, and when they are employed they have a marked tendency to make the dissecting-room disagreeable and dirty.

When well embalmed subjects are placed in cold storage (below 32° F.) they may be preserved indefinitely. Yet, simply freezing the subject does not accomplish the object

FIG. 2. INJECTING APPARATUS IN THE EMBALMING ROOM

The upright tank is connected with the water main, from which it is filled, thus giving a large quantity of compressed air. This is used to drive the embalming fluid into the arteries.
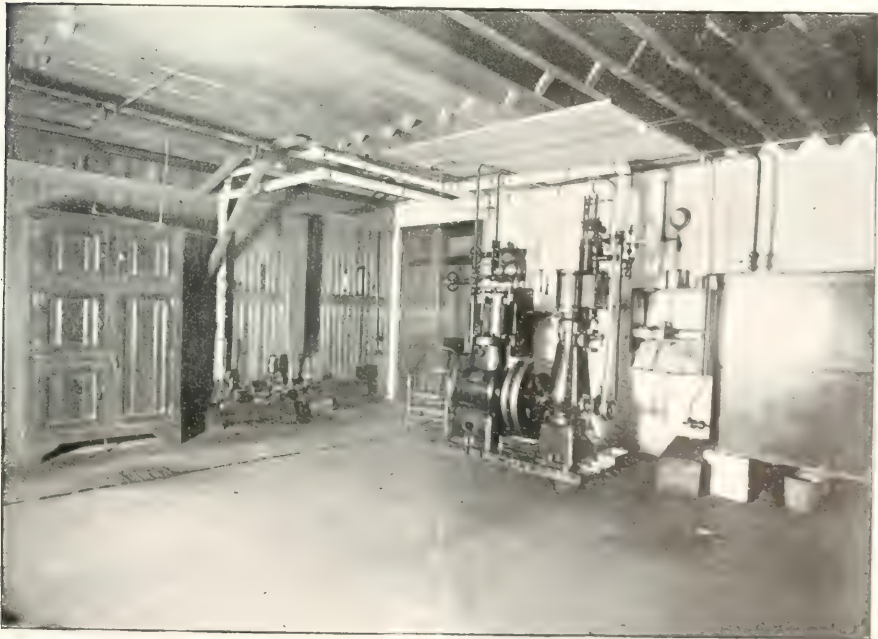

FIG. 3. FLASH-LIGHT PHOTOGRAPH OF THE REFRIGERATING APPARATUS IN THE BASEMENT

The vault is on the left, as indicated on the sectional view, Fig. 4.

perfectly. We are in the habit of believing that cold air is dry and will prevent evaporation, but even at a very low temperature (20° F.) there is a marked evaporation. Our vault is cooled from above, and the slight difference of temperature between the floor and ceiling of the vault is sufficient to dry completely the fingers and toes of the subject in the course of six months. This moisture, which leaves the floor of the vault, forms into large icicles about the steel pipes immediately below the ceiling of the room.

I have often been struck with the remarkable property of the epidermis to prevent the drying of the skin, even after it has been in a warm room for several months. This property can be increased to a very great extent by oiling the skin, a method we employ altogether to prevent our subjects from drying while the dissection is taking place. Vaselin is much superior to oil, and after many trials we use it exclusively to keep the skin soft and moist, both in the cold storage and in the dissecting room.

After the body has been embalmed it is smeared over with a large quantity of crude and cheap vaselin, and then wrapped with the continuous roll of water-closet paper. A second coating of vaselin in places over the paper covering the feet and hands and then the whole body is wrapped in muslin. This mummy-like body is now frozen and preserved in the cold storage. I have now kept subjects treated in this way for two years in the cold storage, and when placed upon the dissecting table they have all the appearance of fresh bodies. The wraps are not removed from the legs and arms until they are about to be dissected; they prevent the skin from drying before it is removed.

My experience, therefore, shows that subjects may be preserved perfectly and in the natural condition for years with carbolic acid, vaselin, and freezing.*

The Freezing Apparatus and Vault.—In applying cold storage in our laboratory it was necessary to adjust it to the heating apparatus of the building. The boilers for heating the building are 60 horse-power strong and are employed during the daytime of the winter only. It was necessary that they be high-pressure boilers, while the heating apparatus of the building requires low-pressure steam. If this could not be the case it would be necessary to add an additional boiler, calling for, in all probability, an additional fireman with additional expense for coal during the winter. This difficulty was overcome by the introduction of a reducing valve between the boilers and the heating system, which reduced the steam pressure to about one atmosphere for the heating, leaving high pressure in the boilers for the engine. The exhaust steam from the engine is allowed to escape into the heating apparatus, and thus performs an additional work in heating the building after it comes from the engine. An automatic pump forces the condensed steam back into the boilers.

The engineer is in the building during the daytime only, so

we desired to construct our apparatus in such a manner as to accomplish the work for the whole twenty-four hours by operating the engine during the daytime only. If this were not the case it would cause a considerable extra expense to run the machine all night. This obstacle we overcame most successfully. In fact our ice machine and vault can do all the work we desire of it by working but a few days *per week*.

Then the apparatus must be relatively inexpensive. Before deciding upon the machine we purchased, we communicated with a number of firms, and believe that we have procured the cheapest as well as the best. Our machine and vault were constructed by the Remington Machine Company of Wilmington, Delaware, and cost considerably less than $4000. The cost of operating the machine in addition to our ordinary expense of heating the building has been less than $100 per year. The capacity of the vault is about 200 subjects, but can be enlarged sufficiently to supply all demands.

We purchased a two-ton machine, *i. e.* a machine whose refrigerating capacity in 24 hours is equivalent to 2 tons of ice; a photograph of it is shown in Fig. 3. This machine much more than fulfills our requirements, and may ultimately be used to cool a number of working rooms in the summer. Yet it is very desirable in the construction of any apparatus to have an excess of force at hand. Of the two systems employed for refrigerating a room we selected the indirect. In the direct method the compressed anhydrous ammonia is permitted to escape into coils of pipe suspended in the room through which the heat is absorbed. In the indirect method the coils of ammonia pipes are immersed in brine which is first cooled, and this cold brine is in turn pumped through a system of pipes suspended from the ceiling of the room (see Fig. 4).

In our apparatus the ammonia expands into a long coil immersed in 5 tons of strong calcium chloride solution. B. The operation of the engine, E, first cools this brine, which is now forced by an additional pump, P, through the pipes, b, along the ceiling of the vault, as the figure shows. The tank of calcium chloride brine is placed within the vault, and then when the machine is not running this great quantity of brine absorbs the heat which gradually enters through the insulated walls.

The vault is well constructed with a number of layers of boards, air spaces and mineral wool, as the diagram shows. Each layer of board is covered with one or two layers of paper; the outermost layer is tarred. The door is insulated in the same way and is over a foot thick. The interior is illuminated with electric light. There are thermometers on the outside which read the temperature of the brine as well as that of the air of the vault.

We found that in the beginning it was necessary to operate the machine for 36 hours continuously to reduce the temperature of the vault to 32° F. After this an additional run of the machine for 8 hours reduced the temperature of the vault to 20° F. During this time the brine was circulating constantly through the tubes suspended from the ceiling of the vault. The temperature of the brine at this time had fallen to 0° F., and we have never attempted to reduce it below. With the vault at 20° F., and the brine at the machine has

ANATOMICAL LABORATORY
JOHNS HOPKINS UNIVERSITY.

C = Compressor   O = Oil Separator.   P = Pump.   A = Pressure Gauge.   a = Ammonia Pipe.
D = Condenser.   E = Engine   B = Brine.   F = Back   "   b = Brine
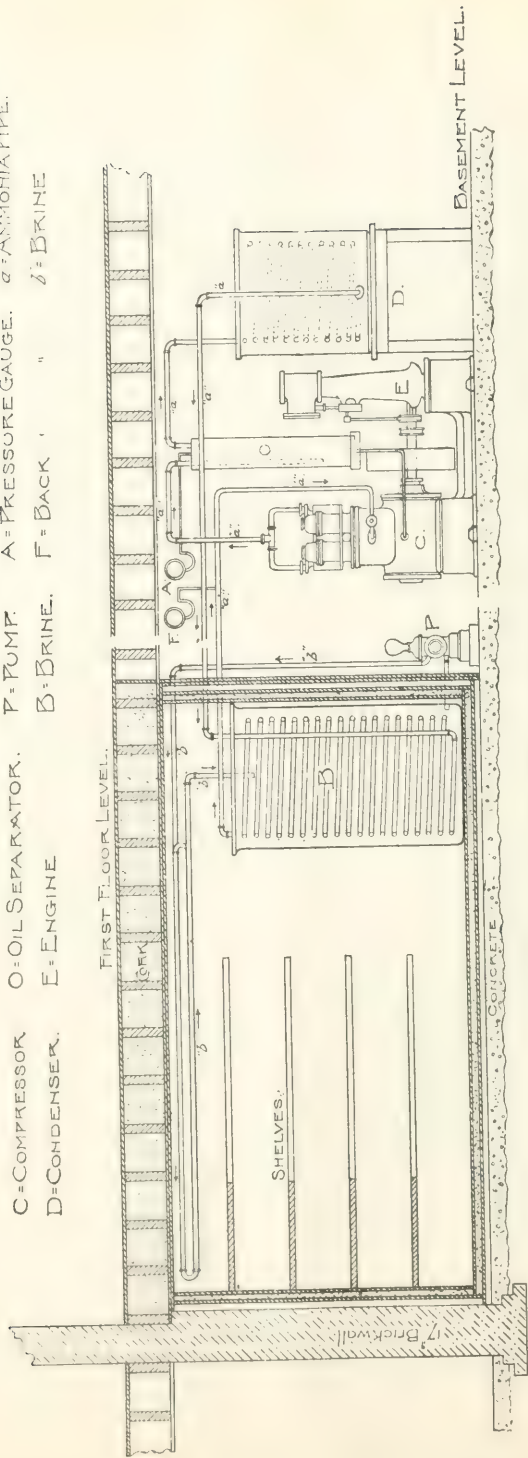
SECTION THRO' REFRIGERATING ROOM.

Feet   0   1   2   3   4   5   6   7   8   9   10   11.
Metres. 0   1   2   3
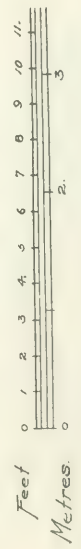
Fig. 4.   PLAN OF COLD-STORAGE APPARATUS AND VAULT.

In addition to the insulation, as shown in the diagram, there is another two-inch air space covering all six sides of the vault.

remain quiet for a whole week, at the end of which the temperature in the vault is 32° and that of the brine 25°. When the temperature of the vault has risen to 32° it is desirable to cool it again, because opening the vault frequently causes thawing, thus making the room very sloppy.

| Date. | Temperature in Degrees Fahrenheit. | | | | | | |
| | Outside. | | Brine. | | Vault. | | |
1895.	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.	Duration of Run.
November 11....	59	69	..	..	29	25	8 hours
12....	59	62	..	..	29	25	2
13....	61	61	..	..	28	25	8
14....	62	73	11	0	26	21	8
15....	72	78	8	..	24	22	9
16....	71	78	6	5	24	20	4
17 ...	..	..	..	..	..	..	0
18....	63	69	14	5	27	23	6½
19....	71	68	10	6	25	21	7
20....	70	73	10	2	26	21	8
21....	..	..	..	..	26	28	0
22....	60	..	..	..	29	..	0
23....	62	..	..	..	31	..	0
24....	..	..	..	..	..	..	0
25 ...	62	73	22	10	32	25	8
26 ...	72	78	13	2	28	23	8
27....	70	76	8	2	25	22	8
28....	..	..	..	..	..	..	0
29....	60	69	13	4	26	22	8
30....	70	76	9	0	24	21	6
December 1....	..	..	..	..	..	..	0
2 ...	64	76	12	0	26	21	7
3....	62	68	8	2	24	20	8
4....	56	57	..	..	27	26	0
5....	57	64	..	..	28	29	0
6....	56	62	..	..	29	30	0
7....	58	64	..	..	30	31	0
8....	..	..	..	..	..	..	0
9....	60	66	..	..	32	32	0
10....	58	67	25	8	32	23	8
11....	59	70	11	1	26	27	8
12....	60	64	..	..	28	29	0
13 ...	59	62	..	..	29	30	0
14 ...	58	62	..	..	30	31	0
15 ...	..	..	..	..	..	..	0
16 ..	49	48	..	..	32	32	0
17 ..	68	78	20	8	32	24	8
18 ..	70	78	8	2	29	20	8
19 ...	70	69	..	..	29	29	0
20 ...	68	68	..	..	30	31	0
21 ...	67	69	..	..	32	32	0
22....	..	..	..	..	..	..	..
23....	..	74	20	6	32	23	8
24....	72	78	11	2	27	21	10
25 ..	..	..	..	..	..	..	..
26....	76	74	8	2	27	20	10
27....	72	78	..	..	28	29	0
28....	71	78	..	..	30	31	0
29..	..	..	..	..	..	..	0
30 ..	68	..	18	..	32	..	8
31 ..	66	..	7	..	25	..	8
1896.							
January 1....	..	..	..	..	..	..	0
2....	68	72	..	..	28	29	0
3....	68	74	..	..	29	30	0
4 ...	61	68	..	..	30	31	0
5....	..	..	..	..	..	..	0
6....	58	60	..	..	32	32	0
7....	60	62	..	..	32	32	0
8....	64	67	20	8	32	25	8½
9....	68	72	11	2	27	20	10
10....	66	68	..	..	28	29	0
11....	68	70	..	..	29	30	0
12 ..	..	..	..	..	..	..	0
13....	61	68	..	..	31	32	0
14....	68	74	18	3	32	22	10

I have now taken the temperature of the vault, brine and outside room twice a day during a whole year, with the time the engine was running. The above table is a portion of this record.

The chart is not as complete as might be desired, for the brine temperature is not given for the time in which the machine is not running. This was not easily done, for it was necessary to start the engine to obtain the temperature of the brine. Our method of managing the apparatus is not to open the vault very much while the engine is not running. When the vault is opened frequently during the day its temperature rises rapidly and necessitates starting the machine. The temperature records of December 2d and 3d are accounted for by the frequent opening of the vault.

After we are accustomed to a cold-storage plant for the preservation of anatomical material it is difficult to understand how we ever got along without it, as difficult as it is to get along without a microtome. It makes us commander of the situation for all times of the year.

In our anatomical course we employ extensively pigs' hearts and lungs, sheeps' heads and other material obtained from the slaughter-house. These materials are frozen and kept on hand constantly. The same applies to preservation of dissections during the holidays when students cannot attend to them. More important than either of these is the preservation of large dissections used in teaching. It dispenses wholly with the large alcohol vats. The large dissections are wrapped in vaselined cloths and simply labeled. It is as easy to manage such dissections as it is to care for a large model. Furthermore, the vault may be considered a large freezing microtome for cutting cadavers, or even for cutting serial sections on an ordinary microtome. And last, but not least, we preserve cadavers not suitable for dissection, as well as carcasses of animals until we are prepared to make skeletons of them.

Before we decided to adopt cold storage we obtained many valuable hints from Professor Huntington of Columbia College, New York, who had employed a machine similar for a greater length of time. I am under many obligations to him for valuable recommendations. Yet our apparatus can be improved in a number of ways, the most important of which I believe to be the construction of two vaults, one within the other; the inner vault to be surrounded completely with the cold brine and to be used for freezing the bodies; the other vault to be used for preserving purposes, and to be kept at 32° F. or slightly below. In this case the engine could be used to cool the brine about the inner vault whenever necessary. Moreover, the outer vault should be surrounded with a brick or stone wall, as the expansion and shrinkage of wood are too great. This expansion is very marked and causes destruction of the insulation, and finally of the whole vault. I should also cover the floor with zinc or some metal and have it drained. It is necessary to clean the vault about once a year, and the extensive thawing is very injurious to the floor.

Ground Floor.—The first floor is occupied entirely by the Pharmacological Department. It contains a large room ultimately intended for microscopical work, but at present used as a lecture room. There is also a combustion room, a library, a chemical laboratory, an experimental room, and a private

room. Through the kindness of Professor Abel the experimental room is used by the advanced workers in anatomy. It is fitted up with the necessary apparatus for registering blood pressure, for artificial respiration, and so on. The motor-power is obtained from the engine in the basement.

Histological Laboratory.—The histological laboratory is constructed with light on three sides in order to have the maximum working space. The main side faces north (Fig. 6). In all there are 15 windows in the room, giving window space for 30 students. The east end of the room is shown in Fig. 7.

room, which is practically the interior of a microscope, and are shown what they are expected to study.

It is the aim of this course to illustrate the general anatomy, as is often the case in systematic lectures, with demonstrations and specimens. During the first half of the course fresh specimens are studied almost altogether, and throughout the course frozen sections are given the class with each organ.

We have a great abundance of pigs' embryos, which can be obtained by the hundred every day. These are used a great deal in studying the histogenesis of the organs.
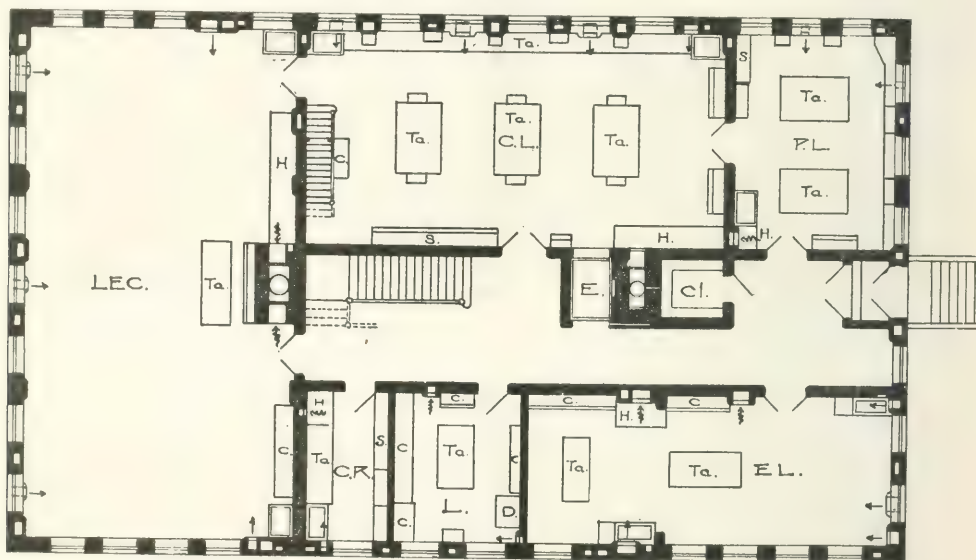
FIRST FLOOR PLAN.
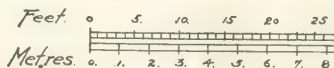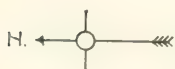
FIG. 5.

LEC, Lecture room. *CL*, Chemical laboratory. *PL*, Private laboratory. *EL*, Experimental laboratory. *L*, Library. *CR*, combustion room. *Cl*, Closet. *H*, Hood. *C*, Cases. *Ta*, Tables. *S*, Shelves. *D*, Desk. *E*, Elevator.

The full capacity of the room is 50 or 60, the additional students to be placed in the middle of the room. Each student is furnished with the necessary outfit and a Leitz microscope, Stand II, with Abbe condenser. Students are permitted to take the microscope from the building, as each one is personally responsible for everything placed in his charge. Each student has also a dissecting microscope.

The lectures are given in the laboratory with necessary charts, models, and gross as well as microscopic specimens to elucidate the subject. Whenever necessary, as in the case of the medulla oblongata, they are all taken into the photographic

In addition to the systematic course given there is an optional course in technique. The class is divided into groups of ten, and each group takes up a class of tissues like the alimentary canal, and so on. The course is not the same from year to year, and this variation proves to be most instructive to the students. They enter the course with enthusiasm and profit a great deal by it. They aid materially also in the preparation of the specimens for the class. Although this course is optional, practically all the students take it.

Throughout the course students are encouraged to read a few special monographs. They soon grow beyond the text-

Fig. 7. Histological Laboratory on the Second Floor.

Fig. 8. South End of the Preparation Room on the Second Floor.

The apparatus and reagents which are used in common for all kinds of histological preparation are in this room.

books, and by this reading gain a much better idea of the scope of histology. We find that with the research method of teaching we can lead the student much further into the subject than without it. Students do better work when you expect much of them than when you expect little.*

Preparation Room.—The preparation room is located conveniently about the center of the building, and is used for all the work of the advanced students, and for the preparation of the specimens for the histological course (Fig. 6, *PR*, Fig. 8). It is fitted up with the necessary apparatus for the work

embalming room, this room contains the apparatus of Ludwig for fine injections made by Petzold.* The hood, arranged with hot and cold water and well ventilated, is intended primarily for the making of corrosion specimens; it also contains the automatic water still by Stoelting.† There is also an incubator and a large paraffin oven, both made by Keen & Hagerty.‡ The glassware of this room as well as all the jars of the building are after the same pattern, and have been made by Jahneke & Hofmann.§ The jars are all ground flat on top, and are either fitted with flat lids with a knob or,

SECOND FLOOR PLAN.

Feet 0. 5 10 15 20 25

Metres. 0. 1. 2. 3. 4. 5. 6. 7 8
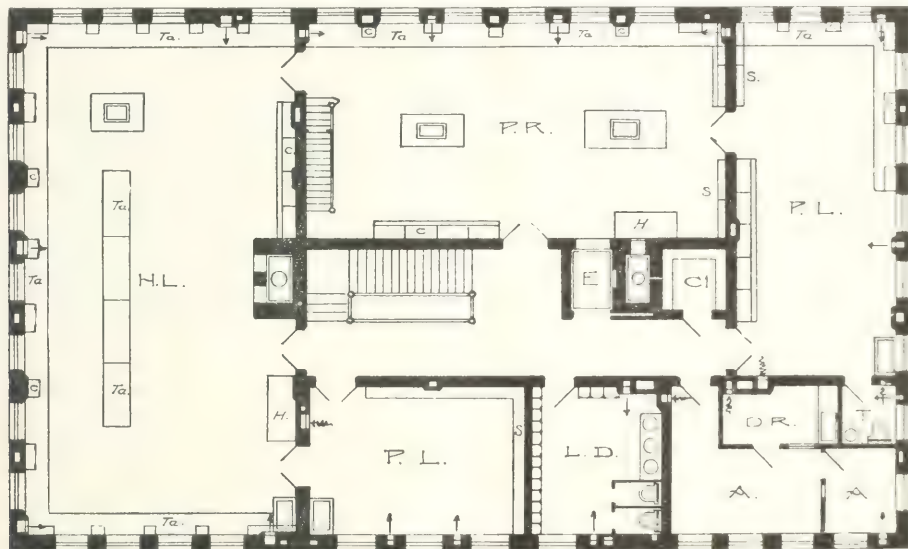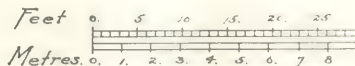
FIG. 6.

HL, Histological laboratory.　*PR*, Preparation room.　*PL*, Private laboratory.　*DR*, Dark room.　*L*, Light room.　*A'*, Projecting room.　*LD*, Women's dressing room.　*T*, Toilet.　*H*, Hood.　*C*, Cases.　*S*, Shelves.　*Ta*, Table.　*E*, Elevator.　*Cl*, Closet.

—a set of Grübler's stains† and other reagents; ordinary microtomes of Thoma‡ and Schanze;§ the Minot microtome by Zimmermann,‖ and the CO_2 freezing microtome of Bausch and Lomb.¶ In addition to the large injecting apparatus in the

as in the case of the large jars, with ground plate glass. Along the wall there are a number of beakers for galvanized sections, microscopes, etc.

In the center of the room are two large preparation tables, drained to a central sink, with hot and cold water and gas. These are extremely useful for all kind of work, from boil-

* The details of this course are given by Barker and Bardeen. Johns Hopkins Hospital Bulletin, Baltimore, No. 62.
† Dr. G. Grübler & Co , Bayerische Str. 63, Leipzig, Germany.
‡ R. Jung, Landhaus Str. 12, Heidelberg, Germany.
§ M. Schanze, Bruder Str. 63, Leipzig, Germany.
‖ E. Zimmermann, Emilien Str. 21, Leipzig, Germany
¶ Bausch & Lomb Optical Co., Rochester, New York.

* N. Petzold, Bayerische Str. 18, Leipzig, Germany.
† C. H. Stoelting Mfg Co., 198 South Clinton St., Chicago, Ill.
‡ Keen & Hagerty, Baltimore, Md.
§ Jahneke & Hofmann, Frauenwald in Thür., Germany

ing of reagents, or making wax plates, to distilling alcohol. This room is among the most active in the building, and takes the place among the advanced students which the dissecting room does among the beginners. It is the general shop of the laboratory.

While there has been a great agitation in Europe for a *Studienzimmer*, I believe that the great need is just such a room as I have described for advanced students. We have also a study room, but it loses much of its force, because all the dissecting rooms are study rooms. Yet we have one room where the student can make shorter dissections and study preparations.

Photography.—Optical apparatus in connection with photography is such an essential to morphological research that before our laboratory was designed we purchased the large Zeiss outfit, with modifications similar to those I have had made for the University of Chicago four years ago. This apparatus had designed for it rooms as shown in Fig. 6, *A*, the idea being to enter the "camera" for all kinds of work.

We have, however, made a number of alterations in the electric light as well as in the screen for the reception of the picture projected. Dr. Hoen has had adjusted to the Zeiss apparatus a lamp of 4000 candle power, for alternating current, which is most satisfactory in every respect.* We have a set of lenses which enables us to enlarge any picture from one diameter to two thousand, and a movable screen aids us to obtain a given number of diameters easily, which is necessary for reconstruction work.

Our photographic lenses have been made by Zeiss, and they are interchangeable from the ordinary camera to the Zeiss camera, as well as to the lens holder on the large Zeiss projecting apparatus. This last arrangement enables us to use these lenses for the projection of histological sections as well as for lantern slides.

This room is perfectly dark, thus permitting us to expose a negative or a bromide by simply attaching it to a screen as described by His.† The screen we employ is movable and very simple in its construction. It is more fully described by Dr. Hoen. By opening the blinds daylight is admitted into both projecting and developing rooms. We thus have complete command of the light, enabling us to use the rooms for a variety of purposes.

Private Rooms.—The rooms marked *P, L,* and *A,* on the second floor, as well as three rooms on the south side of the third floor, are used as private rooms for advanced students at present. The arrangement of one of these is shown in Fig. 9. The fact that the furniture and cases are only loosely attached to the rooms enables us to rearrange the whole laboratory from time to time as circumstances demand.

Dissecting Rooms.—The traditional large dissecting room has been abandoned altogether. As a substitute for it we have nine small rooms, the largest one to hold eight or ten dissecting tables, while the smallest room holds but one table. The upper floor was at first constructed as two large and two small

rooms, and after the building was finished the additional rooms were made by inserting thin partition walls, as shown in Fig. 10. This arrangement facilitates enlarging the rooms at any time if necessary.

The criticism has frequently been made that it is difficult to discipline the students if an instructor is not always present. Our experience proves that this is not the case, as the students remain quiet and orderly without the presence of the instructor. They know that their only opportunity of learning anatomy is in the dissecting room, and generally utilize it. The universal opinion of the students is in favor of small rooms, and most of them prefer the rooms with but one table. The same order is insisted upon for the dissecting room as for the lecture room, and all are agreed that it is for the best. I allow the students to arrange their own dissecting classes, and always favor the good students by placing them in a room by themselves whenever possible. No smoking or loafing is permitted, and this again favors the work of the student.

Each room is fitted up with tables, chairs, book racks, hot and cold water, a sink, model cases, and a blackboard. In fact each is a study room by itself. Fig. 11 shows a corner of one of the smaller rooms. The floors are of Georgia pine, and are saturated with paraffin once a week, and are usually kept very clean. As soon as they become slightly soiled they are scrubbed with lye and saturated with paraffin again. Each room has a skylight, which, with the addition of the great number of windows, gives a most excellent light in all parts of the room.

The subjects come into the room vaselined and wrapped as described. The extremities are kept wrapped with the vaseline until the skin is removed, and when the body is cut the muscles are kept from drying by means of moist, but not wet, cloths. An excessive moisture favors decomposition and also soils the floor.

The course in practical anatomy begins immediately after the completion of the brief course on osteology. At the beginning of the session each student is loaned a skeleton for the year and also assigned a place in the histological laboratory. The latter entitles him to an outfit and the use of a Leitz microscope, Stand II, with an Abbe condenser, eyepieces I and III and objectives 3 and 7. During the second year a $\frac{1}{12}$ oil immersion is added to the microscope. He thus has the use of a good microscope throughout his student time at this University.

During October the beginners are requested to arrange themselves into groups of twos or fours to aid the instructor in making up the dissecting classes. The first subjects are dissected by six students, the two on the head being second year students and working on alternate forenoons. The beginners start on the abdomen and chest. The weekly task placed before each student during the winter is about as follows. It must be remembered, however, that after the dissection is fairly well started each student works for himself and by himself.

In the following chart Class No. III is composed wholly of second-year students. First-year students, who begin with Class No. I, usually dissect the whole body in 22 to 26 weeks.

* Hoen, The Photographic Room of the Anatom. Lab., Johns Hopkins Hospital Bulletin, Nos. 62–63.

† His, Mikrophotographisches Apparat. d. Leipziger Anatomie, Leipzig, 1892.

Fig. 9. A Private Laboratory on the Second Floor

Fig. 11. Inside View of One of the Dissecting Rooms on the Fifth Floor

APPROXIMATE ARRANGEMENT OF THE COURSES IN GROSS ANATOMY AND IN HISTOLOGY.

Week.	20 to 30 Hours per Week.			15 Hours per Week.	Week
	Osteology.			Histology.	
1	Spinal column..........	....	....	Vegetable cell and fibers.....	1
2	Upper extremity	....	....	Animal cells, egg and germ	2
3	Lower extremity	....	....	layers.	3
4	Head....................	....	..............Head....	Cartilage and muscle........	4
5	Head....................	....	..............Head	Neuron	5
6	Head....................	....	....	Blood.......................	6
	Class I.	Class II.	Class III.		
7	Abdominal walls	Chest walls	Superficial neck....	Blood-vessels, lymph and lymphatics	7
8	" viscera	Axilla.....	Deep neck...................	Bone.	8
9	"	....	Face........................	Connective tissue fibrils......	9
10	Lumbar plexus and thigh	Front of arm.................	Sympathetics and heart........	Muscle	10
11	Back and gluteal region	Back........................	Back of neck................	Alimentary canal	11
	Body divided.		Arm removed.		
12	Perineum (pelvis cut)...........	Back of arm.................	Temporal and frontal region...	Alimentary canal	12
13	Thigh....................	Remove muscles	Muscles of mastication & nerves	" " "	13
14	Leg and foot		Tongue and larynx	Urinary organs..............	14
15	Remove muscles	Class I.	Base of skull	Reproductive organs	15
16	Class II.		Eye	Skin and nose	16
17				Eye and ear	17
18			Class I or II,	Spinal cord	18
19			or	Medulla oblongata	19
20			Special Dissection.	Medulla oblongata	20
21				Brain	21
22				Brain	22

About one-half of the first-year students do not dissect the head until the second year.

All of the students have had one year each of physics, chemistry and biology before coming to us. Most of them have had a course in practical embryology. The course in embryology at this University is given during the spring of the year.

John Hunter has expressed himself that the only way to learn anatomy was by dissection and dissection and dissection. We believe firmly in this method and add to it *concentration*. If any one desires to know the very essence of an investigator's spirit let him read the introduction of v. Bear's Embryology.* The feelings of a scholar are expressed on every page. His association with his instructors meant so very much to him. Later, in his autobiography,† he rehearses the early period of his life and says: "Often during my life then,‡ as well as later,§ have I doubted the wisdom of our university courses. It seemed to me that the whole system was wrong in that it compels us to take a number of courses for 45 minutes at a time in order to convert our information into a heterogeneous mass. Would it not be better if we could study one subject after the other, so that we could busy ourselves with one, or at the highest two, subjects continuously for several weeks?" He continues this thought further, and finally states that whenever we wish to do anything thoroughly we do one thing at a time.

As a student I demanded the privilege of studying one subject at a time and was often envied by my fellow-students.

The privilege I then demanded I now gladly give my students and am extremely well gratified with the result. Continuous individual instruction is not easy and takes much time, yet I believe that I can carry the plan through with a much greater number of students than I now have.

At present we devote 22 continuous weeks to gross anatomy and histology exclusively during the first year, and about the same time to the dissecting room during the second year. In later years the students may continue to dissect, and if they are especially desirous of studying a number of parts at the same time they are employed as student demonstrators.

Our dissecting room is open every day from Monday morning until Saturday evening, and with a class of 70 we have an average attendance of 30 students during all this time.

Each student keeps a complete record of all the nerves he dissects, and when he has finished the parts he is examined on what he has dissected before the muscles are removed. I keep on file a card for each dissection which ultimately receives all the notes the instructors have made of the quality of his work. This gives us a permanent record of all the work which is done by the student in our laboratory.

With all this precaution we still have poor students. First and foremost we are careful in admitting those students who have had a good training,* and then when they come to us

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* v. Bear, Entwicklungsgeschichte der Thiere, Königsberg, 1828.
† v. Bear, Nachrichten über Leben und Schriften, St. Petersburg. 1866.
‡ 1815.
§ 1866.

we give them an opportunity to work. Some, however, are not bright, and a few others are not inclined to work. They, of course, do not accomplish much, and I should feel inclined to hold our method of instructing them in anatomy responsible for it were it not that they do equally poor work in other departments where the lecture method is employed.

Study Room.—In recent years there has been an agitation in favor of teaching anatomy by means of a study room. This method is practiced in many universities by placing the objects used to illustrate a lecture at the disposal of the student after the hour; he can then take the specimen in his hand and see for himself. A few students utilize this opportunity, but it is only of much value to advanced students.

If now all these specimens and models are placed together in one room which is at the disposal of the student, we have the study room as arranged by Rauber* in the University of Dorpat, or by Kollmann† in the University of Bâle. Similar

methods of instruction are employed in the Austrian universities, and I have observed their use in Professor Toldt's laboratory in Vienna. Professor Drasch of Graz also informs me that they were used extensively while he was a student. We are all familiar with the excellent exhibitions of anatomical specimens in the English laboratories and museums and appreciate fully their importance as recently emphasized by Prof. Keiller.*

A whole series of papers has been written during the last 20 years about the teaching of anatomy, and the universal opinion is in favor of teaching and studying at the same time;† to study the object from every standpoint. There has been a marked revulsion against simply giving the students the *results* of anatomy—the favorite method in America to-day. The references just given will be very instructive to the advanced students of anatomy and I recommend that they be read freely.

In the early part of this century Rudolphi‡ wrote an essay on the various methods of learning anatomy and gives an extensive literature on the subject. "Yet," he says, "it is wholly indispensable for those who wish to study anatomy to make their own dissections, for the best preparations made by others, the best plates, etc., cannot take the place of specimens made by the students. It is altogether a different thing to have dissected the vessels and nerves for one's self and to have observed their relations, than to have simply seen the finished preparation in which the parts are more or less distorted." In this way Rudolphi continues in the most interesting manner.

In our laboratory we have set aside a large room as a study room, but find that there is no special demand for it as long as the students can make their own dissections. As soon as they have begun work it is easy to make them find most of the fine nerves as well as the sympathetics, and after the part is fully dissected it is taken to pieces systematically (and this is the review); then the ligaments are studied. We have made a study room of all of our dissecting rooms, and our *Studien-zimmer* remains as a room for special and briefer dissections. It is fitted up with coarse vises for holding sheeps' heads and useful things of that kind. When students desire to study the peritoneal cavity of a lower animal, to dissect or macerate hearts, or to dissect sheeps' eyes, this room is used. Here they also study finished dissections and models which are at all times at their disposal. Throughout the dissecting rooms there are large cases in which are exposed many of the models and preparations of Ziegler,§ Steger,‖ Benninghoven

physics, chemistry, and biology as is imparted by the regular minor courses given in these subjects in this university.

The phrase "a minor course," as employed in this university, means a course that requires a year for its completion. In physics, four class-room exercises and three hours a week in the laboratory; in chemistry and biology four class-room exercises and five hours a week in the laboratory in each subject are required.

Many inquiries have been received regarding the character and amount of the requisite training indicated by the term "Minor Course" in these sciences. In explanation, it may be stated, with respect to Biology, that the candidate should have followed for at least a year a laboratory course in the structure, life history, and vital activities of selected types of animal and vegetable life. In the Chemical-Biological course for undergraduates in this university the laboratory work in biology at present includes the study of such types as amœba, hæmatococcus, yeast, penicillium, bacteria, mushroom, hydra, vorticella, a fern, a flowering plant, the earthworm, lobster, anodon; the gross and minute anatomy of the frog, the development of its eggs, the structure, formation, and metamorphoses of the tadpole; the study and drawing of the bones of the human skeleton; the comparison of some parts of related vertebrate skeletons; dissection of a mammal; the field and laboratory study of some few flowering plants. The laboratory work is the more important part, the lectures and other exercises subsidiary. It is, of course, not to be understood that this curriculum of biological work must be rigidly followed. Equivalent work will be accepted.

The candidate should have followed a course in general Chemistry for at least a year. This course should include laboratory work, about five hours a week through the year, and lectures and class-room work covering the outlines of inorganic chemistry and the elements of organic chemistry. A good knowledge of the subject as presented in Remsen's "Introduction to the Study of Chemistry" may be regarded as the minimum requirement. A fuller knowledge of Chemistry is, of course, desirable.

In Physics, the candidate should have followed a collegiate course for at least one year. This course should include four hours a week of class-room work and at least three hours a week of quantitative work in the laboratory. Special attention should be given to theoretical mechanics and to the mechanical and electrical experiments.

3. Those who give evidence by examination that they possess the general education implied by a degree in arts or in science from an approved college or scientific school, and the knowledge of French, German, physics, chemistry, and biology above indicated.

* Rauber, Entwicklung von Studiensäle, Leipzig, 1895.

† Kollmann, Archives des sciences physiques et naturelles, t. 28, 1892, and Verhandl. d. anatom. Gesellschaft, 1895.

* Keiller, New York Medical Journal, 1894.

† His, Auffassung der organischen Natur, Leipzig, 1870; His, Aufgabe u. Zielpunkte der Wiss. Anat., Leipzig, 1872; Turner, Address at the Opening of the new Anatomical Department at the University of Edinburgh, 1880; Hertwig, Der anatomische Unterricht, Jena, 1881; Schiefferdecker, Der Anatomische Unterricht, Deutsche Med. Wochenschrift, 1882; Kolliker, Die Aufgaben der Anatom. Institute, Würzburg, 1884; Waldeyer, Wie soll Man Anatomie lehren und lehrnen, Berlin, 1884.

† Rudolphi, Ueber Anatomie, Berlin, 1828.

§ Ziegler, Freiburg in Baden, Germany.

‖ Steger, Thalstr. 26, Leipzig, Germany.

and Messing,* Auzoux,† Tramond,‡ as well as the wire models of Abbe and Edinger.

The finer preparations of bones are employed to elucidate the course in osteology, and there is an abundance of loose bones at the disposal of the instructors. In addition to excellent mounted skeletons we have complete skeletons, which are loaned to the students for the whole year. If there is any breakage or loss of bones the student must pay for a new skeleton. The method of placing good specimens and instruments at the disposal of students works admirably when the responsibility of keeping them in good order rests upon the student. Whenever the student wishes to study the attachment of muscles or anything of that kind, a mounted skeleton is placed at his disposal in the study room.

The plan of the third floor shows the arrangement of the

women are in a special room on the second floor. This room is also fitted up with a table, a few chairs, washstands, with hot and cold water, and closets. The closets for the men are in the basement and the third floor, while in addition to these there is a private closet for each floor.

Store-rooms.—One of the most important adjuncts to a laboratory is an abundance of store room. There is on each floor a large hall room for the use of the janitor's utensils, laundry, and so on ; each is well ventilated. In addition to the cold storage we have two rooms in the basement in which to keep alcohol specimens during the summer and at other times when they are not in use. The whole fourth floor is one large store room communicating with the elevator (Fig. 13). A glance at the plan will show the arrangement. The central hall is illuminated by all the skylights of the building, thus
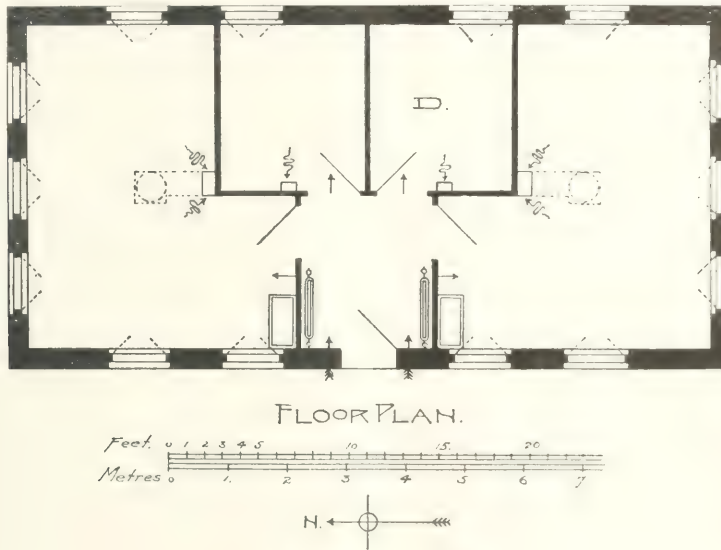
FIG. 14. THE ANIMAL HOUSE.

model and specimen cases. The models are well displayed and can be taken out easily to demonstrate any point as it may arise.

Lockers.—There are a number of hat and cloak hooks in the halls of the first and second floors, where students can lay off their wraps easily before going into the histological laboratory or the lecture room. On the third floor there are a number of lockers for men, with latches, but the padlocks must be supplied by the students if they desire to lock them. In the autumn the lockers are assigned to the students, who may retain them for one complete year, thus giving them a place to lock up their things during the summer. The lockers for the

making it a very agreeable room to work in. In addition to this there are twelve large store rooms used for all kinds of bulky ware necessary in an anatomical laboratory. Special rooms are set aside for glassware and others for chemicals. As we still import most of our equipment, it is necessary to lay in a stock for the whole year and to have an abundance of storing space. The alcohol and other very inflammable substances are stored in an underground vault outside of the building, which communicates with the basement. This enables us to procure a sufficient supply, duty-free, as far for a year. Under no conditions could we keep a large quantity of inflammable material on hand without such a vault, for it would be impossible to place an insurance upon the building.

Animal House.—One of the most difficult problems in the construction of a laboratory is the care of live animals. A

* Benninghoven and Messing, Dorotheenstr. 38, Berlin, Germany.
† Auzoux, Rue de Vaugiard 56, Paris, France.
‡ Tramond, Rue de l'Ecole de Medecine 9, Paris, France.

number of methods are employed, and it matters little whether the animals are kept in the basement or the attic, they are a nuisance and hard to care for. When either of the above arrangements is made it is impossible to make any alterations in the room from time to time as circumstances demand. The simplest and easiest method is to construct a special animal house. Our animal house is completely separated from the building, and has its own yard in which the animals can run about. The house (as Fig. 14 shows) is divided into four rooms, each of which is ventilated by itself. There are hot and cold water in the large rooms, and all the floors are asphalted and drained. The rooms are heated by steam from the boilers in the main building. In addition one of the rooms has a large coal stove for heat during the night in cold weather. We can thus give animals every comfort and cleanliness, and find that under these conditions dogs are not very noisy. The house is practically a hospital for operated animals, monkeys as well as dogs.

A space has been set aside in the basement for aquaria, but they are yet to be constructed.

Macerating Rooms.—A large room on the fourth floor is fitted up especially as a macerating room. It has a special ventilating flue, a store room adjoining for clean bones, and a large balcony for bleaching and drying purposes (Fig. 13, *BB*). The room has hot and cold water as well as a special steam connection with the boilers in the basement. The skeletons which come from the dissecting rooms are placed in sacks and numbered, which in nearly all cases completes the record of each subject. The bones from the subjects embalmed with carbolic acid are cleaned with lime or 1 per cent acetic acid. In either case we must boil them; and this is easily done with steam. In addition to these skeletons we obtain subjects too far advanced in decomposition to embalm, and they are first frozen and then cleaned as soon as time will permit, often a year after the subject is obtained. All of the bones cleaned are preserved until summer, when the fat is extracted from them. Our extractor was made by Lentz,* and it is set up in the animal house for additional security in a room containing the alcohol stills. The water-bath of the apparatus is heated with live steam, which is easily controlled and is more satisfactory as well as safer than the gas flame. The apparatus can be started and may run for days without any special attention.

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* E. A. Lentz, Spandauerstrasse 36 and 37, Berlin, Germany.

AN OUTLINE OF THE COURSE IN NORMAL HISTOLOGY AND MICROSCOPIC ANATOMY.

By Lewellys F. Barker, M. B., and Charles R. Bardeen.

The problem of reducing to a minimum the amount of energy expended in the routine work of teaching is one which necessarily interests every working histologist. While we would deprecate the adoption of a fixed, rigid programme to be followed year after year, we believe that in a subject like normal histology, where many of the methods employed are constant, a careful list of the work actually done and of the methods actually used during one or two years will be of considerable service as a basis for the organization of the course in ensuing years. The programme which we present here is almost exactly that which has been followed during the past year in the Johns Hopkins Medical School. It is by no means intended to represent an ideal course in histology; on the contrary, it has very obvious defects, some of which we hope soon to be able to remove. It is simply a course which has been given, adapted to certain conditions, and one to be modified from time to time with changing conditions and as further experience of our own and others shall indicate.

In framing a course in histology for the regular students of this school there were certain points which demanded particular consideration. In the first place, the class of students might fairly be expected to differ from that of the average medical school. Every student, in order to gain admission, must have a college degree or its equivalent, must possess a good reading knowledge of French and German, and in addition give evidence of having studied biology, chemistry and physics, including practical laboratory work in these subjects during at least one year. It might be safely assumed that the average student in such a school, as a result of his previous scientific training and experience, would be able to do more and better work in normal histology and microscopic anatomy, than has before been expected of medical students, and our experience thus far justifies such an assumption. One difficulty which speedily became obvious, however, was the unequal preparation of the different students for microscopic study on entering the school. Whereas some of the students had worked extensively with the microscope, an occasional one having had more than a year's instruction in practical histology, others in their work in practical biology had done little normal histology or none at all. In organizing a course, the needs of all the students had to be considered, and arrangements were made by means of which the experienced found work difficult enough for them, and the untrained were given tasks which were not beyond them. It is probable that this inequality as regards preliminary attainments in microscopic work will grow less with the years, since the students admitted at the beginning of the school have had no opportunity of directing their preliminary education to suit the requirements of admission. But there must always be greater individual differences, probably, among the class of students entering such a school, than in the medical school requiring no college degree before admission, inasmuch as, other things being equal, specialization and individuality increase *pari passu* with age and educational advantages.

In deciding as to the plan to be adopted in the course we have been much influenced, too, by the fact that our students are students of medicine. Thus it will be noticed that in the selection of tissues, those from the human body make up a large part of the material used; and when animal tissues are employed, special care has been taken to point out how they

differ from the human. Moreover, in deciding what to exclude from the course—for this we think as important as the matter included—thought was given to the bearing of the specimens on the practical work in medicine which was to follow, and stress was laid upon those portions of human histology which previous experience has taught us are of the most importance in the appreciation and interpretation of the pathological alterations in disease. While in the future all detail will, we must believe, be found to be of importance to the pathologist, in the present status of pathological histology a knowledge of certain details is of much greater value than that of others; and for the student entering medicine, a judicious selection of what shall be given and what shall be left out should be made by some one who has had a more or less wide training in pathological histology.

The time is now past, we believe, when an instructor in pathology should be compelled to devote the time intended for the study of diseased tissues to instruction in normal histology and microscopic anatomy. It is true that every student has his knowledge of normal structures widened and more firmly rooted by good courses in pathological histology, but he should not meet with normal appearances in these courses for the first time.

Further bearing in mind the life-work for which the student is preparing himself, we have not, in this course, always chosen the method which would show the finest structural details of the tissues. While the most delicate methods have been introduced in places, we have endeavored to familiarize the students with a large number of different modes of preparation, and to help them to understand the varying appearances of one and the same tissue under different methods of preliminary treatment. A piece of spleen hardened in Müller's fluid is quite unlike a portion of the same organ hardened in alcohol or in Flemming's mixture, and the appearances of such tissue in stained section differ still more from those to be seen in a frozen section of the fresh spleen. The student who has been brought up entirely on "gilt-edged" histological methods will find himself sadly at a loss in battling with the "rough and ready" world in which the pathologist has to live.

Nor could we leave out of account, in framing the course, the fact that in the studies of the subsequent three years, various portions of the body are again submitted to extended microscopic investigation. Thus in the second year in the department of pathology, a preponderance of attention is paid to the structure of certain of the organs; in the third year in the department of medicine, the blood of patients is submitted to very accurate color-analyses, and in the course in obstetrics the histology of the female genital organs is again thoroughly reviewed. In surgical pathology, microscopic work is also done, and in the planning of the courses in neurology, dermatology, gynæcology, ophthalmology, etc., provision will doubtless be made for microscopic work.

The course beginning October first extends to March fifteenth. Three *full* half-days are devoted to regular class work, and additional time throughout the week is available for special work in technique, recitations and drawing. Between March fifteenth and June first considerable time

is available for review, and for extra work for those students who have had difficulty in keeping pace with the course while in progress.

The teaching, consisting in the main of practical work in the laboratory under the direct guidance of a corps of demonstrators, is supplemented by a series of 60 lectures with demonstrations, explanations of charts and models and darkroom projections.

After some introductory work on the cell in general, and a review of the blastodermic layers, the student begins his histology with the study of the morphological units in the body, that is to say, with the study of general histology, and proceeds to the study of the architecture of the organs (microscopic anatomy) only after he has had considerable experience in isolation and dissociation by means of teasing, tearing, dissecting, macerating, corroding and digesting the elementary tissues. It has seemed to us that this system has marked advantages over that in which histological studies are begun with the study of organs. The student who tries to study organs when he cannot recognize almost at a glance epithelium, smooth muscle, striped muscle, cartilage cells, nerve cells, nerve fibres and the like, is comparable to the student in chemistry who attempts to understand and memorize the reactions of complex organic compounds without having been taught the significance of an alcohol-, an aldehyde-, an amine- or amide-group. Familiarity with units is, we are convinced, the only key to a proper understanding of the tissues. And thus in the study of organs the student is stimulated to search for morphological units of a higher order—for example, vascular or secretory units—a task which can often be lightened by the study of developing tissues where such units may generally be seen in simpler forms.

From the first the student is advised to pass as gradually as possible from the naked eye appearances to the relations as seen under high powers of the microscope. Thus after the naked eye study in the course, and the color, odor, consistence, etc., have been noted, pieces of the tissue are examined with the aid of the dissecting microscope (8-20 diameters), first in bulk and afterwards dissociated; only then does the examination with higher powers of the microscope begin, at first with low powers and finally with high powers, in some instances with oil-immersion lenses.

During the early part of the course very few microtome sections are permitted, and, throughout, the importance of methods other than those of mere sectioning is especially emphasized. The student goes to the animal body or to the cadaver in the dissecting room, sees the general relations of the tissues there, procures for himself the specimen, and thus is taught how and where material for study is to be obtained.

In addition to the regular class work, to each student is assigned the task of the complete preparation of some tissue or set of tissues, involving the processes of fixing, hardening, embedding (in celloidin and paraffin) and sectioning. Some members of the class will take more of this sort of work than others, and as all of it is done under the direct supervision of an instructor, the acquired experience cannot should be subsequently helpful.

It will be noticed in the tables that thirty-two lectures are

of embryonic tissues. Starting out with the blastodermic layers, the student from the first is taught to lead all tissues, as far as possible, back to their early embryonic origin, and through the whole course no small measure of the attention of the student is directed to the histogenetic relations, at different stages, of the tissue or organ under consideration.

While the morphological facts are necessarily the first objects in the course, still the physiological bearings are not entirely lost sight of, and we have had no hesitancy now and then in calling the attention of the students to a physiological, chemical, or even clinical relation when we have thought it important that it should be especially associated in the mind with a certain morphological peculiarity. Thus, while any marked "overlapping" of courses is avoided, the attempt is made to impress upon the student the fact that histology, instead of being divorced from a number of kindred subjects, stands in the most intimate, almost inseparable, connection with them.

The student is encouraged at all times to make careful objective drawings of what he sees.

Text-books in English, German and French are used in the course, and in addition each student is required to read original articles in the literature and to make a careful abstract of at least one scientific article. In this way he gains the habit of going to the sources for his information, is impressed with the limitations of histological knowledge, sees the lines along which original research is moving, and learns the origin of text-books.

It will be observed in perusing the list, that whereas none of the important organs have been omitted, certain parts of the body have been studied in more detail than others. This we think unavoidable, but we have arranged the subjects so that especial attention should be given to those parts of the body in which at present most advance is being made. Thus the sense organs and nervous system, it will be seen, have been examined in considerable detail, and as far as possible the students are made conversant with the newer ideas concerning the minute anatomy and histogenesis of the peripheral and central portions of the nervous system. Preceding this portion of the work, six half-days, in addition to the time allotted to the subject in the course, are given to the student for the study of the gross anatomy of the central nervous system. A series of sections at various levels of the spinal cord and brain are then carefully studied and drawn, and finally several days are devoted to the study of tracts, thus bringing the student's knowledge together in a more or less orderly fashion. Our experience, though brief, has confirmed us in our belief that the histology and microscopic anatomy of the nervous system are properly, for the present at least, included in this course. Much has been demanded of the students, but within certain limits, students, we think, do more thorough work when much is expected of them.

In choosing the methods mentioned in the following list we have been influenced in a given instance sometimes by one factor, sometimes by another. When the method suggested seems at first less desirable than certain others which are in vogue and which could have been selected, it should not be taken for granted that the other method has not been thought of. It may be that the method in question has been chosen to suit a certain particular condition in the course. Still we know only too well that there are many ways in which the list can be improved, and not a few errors which would be better eliminated. We shall be particularly grateful for corrections or suggestions from those who take an interest in the subject. It is an especial pleasure in closing to acknowledge our indebtedness to Professor Mall for helpful counsel and manifold suggestion.

The method here used for designating the main steps employed in preparing the various tissues for histological study was devised as a convenient means of briefly indicating the necessary technique when planning out the work of the course. The writing out in full of the technique used for each tissue was found to take too much time and to be needlessly cumbersome. Word-abbreviation was too apt to be confusing, and thus a completely artificial system seemed on the whole to be the best.* The various technical processes employed in histological study were roughly arranged in eleven-odd groups: *fresh examination, dissociation, decalcification, fixation, hardening, microscopic preparation, staining, clearing, fastening, mounting,* and *special,* and each of these groups was designated by a particular letter of the alphabet. Thus, for example, all the methods used for staining are grouped under "G." The various methods in each group are further designated by numbers, thus *e. g.* staining with borax-carmine is indicated by "G_1"; furthermore, since certain of the technical steps are carried out by the instructors and certain of them by the students, the group representing the particular process is written (or printed) as a "capital" when representing work done by the instructor, as a "small letter" when it is done by the student. An example will make this clear: In indicating the methods used in preparing the cardiac end of a dog's stomach for microscopic examination, the following signs are used: "D_3; E_2; F_3; g_3, $_{12}$; k_3," which being interpreted means that the tissue was (1) fixed in Zenker's fluid; (2) hardened in graded alcohols; (3) embedded and sectioned in celloidin by the instructor; and by the student (4) stained in hæmatoxylin and eosin; and (5) mounted in balsam. Only the more important steps, or those to which especial attention is to be called, are indicated, thus the clearing agent most often used in the daily routine of the classroom, carbol-xylol, "H_1," is seldom put down among the steps of the technique.

With this explanation it is hoped that the following tables and the programme will be clearly self-explanatory. The technical methods used are, in the main, those commonly given by the various books on technique, though many of them have been taken from the literature, and a number have been slightly modified to suit our own needs or preferences.

EXPLANATION OF ABBREVIATIONS EMPLOYED.

A.—METHODS OF PRESERVATION OR EXAMINATION IN NATURAL STATE.
   (1) Fresh tissues.

* The method for a similar purpose used by Benda in the "Histologischer Hand-Atlas" of Benda and Guenther (Leipzig, 1895) suggested the method here employed.

    (2) Tissues in normal fluids.
    (3) Tissues in physiological salt solution.
    (4) Tissues in aqueous humor.
    (5) Tissues in blood serum.
    (6) Tissues in iodized serum.
    (7) Tissues in Farrant's medium.
    (8) Tissues in 1 per cent. sugar solution.

B.—METHODS OF DISSOCIATION, MACERATION, CORROSION OR ALTERATION.
    (1) 0.25 per cent. ac. acetic.
    (2) 30 per cent. potassic hydrate.
    (3) 33⅓ per cent. alcohol (Ranvier's alcohol).
    (4) 0.1 per cent. osmic acid.
    (5) Conc. ac. hydrochloric.
    (6) Conc. ac. nitric.
    (7) Müller's fluid.
    (8) 0.1 per cent. potass. bichromat.
    (9) 0.5 per cent. ac. chromic.
    (10) 0.5 per cent. ammon. chromat.
    (11) Digestion with pancreatin and sod. bicarb.
    (12) Digestion with pepsin and ac. hydrochlor.
    (13) Iodized serum.
    (14) Water.
    (15) 20 per cent. ac. acetic.
    (16) Conc. ac. sulphuric.
    (17) Lugol's solution.
    (18) Sat. sol. tannic acid.
    (19) 0.05 per cent. ac. chromic.

C.—METHODS OF DECALCIFICATION.
    (1) 3 to 5 per cent. ac. nitric.
    (2) 2 per cent. ac. chromic.
    (3) Ac. acetic glaciale.
    (4) Müller's fluid.
    (5) Per cent. ac. picric.
    (6) Per cent. hydrochlor.
    (7) v. Ebner's fluid.
    (8) Phloroglucin + ac. nitric (Haug).

D.—METHODS OF FIXATION.
    (1) Heat on copper bar at 120° C.
    (2) Boiling water.
    (3) Steam.
    (4) Absolute alcohol.
    (5) Flemming's solution.
    (6) Hermann's solution.
    (7) Fol's solution.
    (8) Osmic acid vapor.
    (9) 1 per cent. osmic acid.
    (10) 10 per cent. ac. nitric.
    (11) Sat. sol. hydrarg. perchlor. in 0.75 per cent. NaCl solution.
    (12) 5 per cent. formaldehyde.
    (13) Zenker's fluid.
    (14) Bethe's fluid.
    (15) Kleinenberg's solution.
    (16) Equal parts abs. alcohol and ether.

E.—METHODS FOR HARDENING* SOMETIMES USED FOR FIXING, ETC.
    (1) Graded alcohols 33⅓ per cent., 50 per cent., 70 per cent., 80 per cent., 90 per cent., 95 per cent., absolute.
    (2) Graded alcohols 80, 95, absolute.
    (3) 95 per cent. alcohol.
    (4) Müller's fluid.
    (5) Müller's fluid 3 pts. + alcohol (95 per cent.) 1 pt.
    (6) Erlicki's fluid.
    (7) 1 per cent. ac. chromic.
    (8) 5 per cent. formaldehyde.
    (9) Cox's solution.
    (10) Cajal's osmo-bichromic solution (rapid Golgi method).
    (11) 2 pts. Müller's fluid + 1 pt. 1 per cent. ac. osmic (Marchi)
    (12) Weigert's mordant for neuroglia.
    (13) Distension and drying.

F.—METHODS OF PREPARATION FOR MICROSCOPIC EXAMINATION
    (1) Transfer simply to slide.
    (2) Spread out thin on slide.
    (3) Semi-desiccation method.
    (4) Teasing.
    (5) Strip off in layers.

    (6) Free-hand section.
    (7) Section with Valentine's knife.
    (8) Frozen section.
    (9) Celloidin section.
    (10) Paraffin section.
    (11) Dissection.
    (12) Elder-pith section.
    (13) Grinding and polishing.
    (14) Cullen's formaline method.

G.—METHODS OF STAINING AND IMPREGNATING.
    (1) Borax carmine.
    (2) Alum cochineal.
    (3) Indigo-carmine.
    (4) Picro-carmine.
    (5) Upson's carmine.
    (6) Van Gieson's fluid.
    (7) Delafield's hæmatoxylin.
    (8) Böhmer's hæmatoxylin.
    (9) Heidenhain's hæmatoxylin.
    (10) Weigert's myelin stain.
    (11) Weigert-Pal myelin stain.
    (12) Ehrlich's acid hæmatoxylin.
    (13) Eosin.
    (14) Acid fuchsin.
    (15) Acid picric.
    (16) Safranin.
    (17) Methylene blue.
    (18) Aqueous magenta.
    (19) Dahlia.
    (20) Methyl violet.
    (21) Ehrlich's triple stain.
    (22) Weigert's fibrin stain.
    (23) Weigert's neuroglia stain.
    (24) Mall's reticulum stain.
    (25) Boiled gold chloride methods.
    (26) Löwit's gold method.
    (27) Golgi's gold method.
    (28) Lemon juice gold method.
    (29) 0.75 per cent. argent. nitrat.
    (30) Silver nitrate + ammon. hydrat.
    (31) Lavdowsky's modification of Ehrlich's methylene blue method.
    (32) Nissl's methylene blue and soap solution.
    (33) Thionin.
    (34) Gerlach's gold chloride solution.
    (35) Benda's iron hæmatoxylin.
    (36) Aniline blue.

H.—METHODS OF CLEARING.
    (1) Carbol-xylol (ac. carbol. pur. xtls. 1 + xylol 3).
    (2) Xylol.
    (3) Creasot.
    (4) Ol. caryophyll.
    (5) Ol. bergamot.
    (6) Ol. origanum.
    (7) Ol. cajeput.
    (8) Acid glycerine.
    (9) Glycerine.

I.—METHODS OF FASTENING SECTIONS TO SLIDE.
    (1) Mayer's albumen.
    (2) Gulland's water method.
    (3) Schallibaum's collodion method.
    (4) Clove oil collodion method.
    (5) Obreggia's collodion-paraffin method.

K.—METHODS OF MOUNTING.
    (1) Glycerine pur.
    (2) Glycerine 20 + ac. arsenios. trace + water 80.
    (3) Farrant's medium.
    (4) Sat. sol. potass. acetat.
    (5) Xylol balsam.
    (6) Dammar.
    (7) Benzol-colophonium.
    (8) Physiological salt solution.
    (9) Glycerine and alcohol with or without acid.

L.—OTHER METHODS OF PREPARATION.
    (1) Injection with aqueous Berlin blue.
    (2) Injection with carmine gelatine.
    (3) Injection with Berlin blue gelatine.
    (4) Injection with cinnabar gelatine.
    (5) Injection with methylene blue (intra vitam).
    (6) Feeding with madder.
    (7) Artificial œdema.

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* The line between fixing and hardening fluids must of necessity be an artificial one. We have designated as fixing fluids those commonly allowed to act for twenty-four hours or less on the tissues; as hardening fluids those used a longer time than this.

PREPARATIONS.

SUBJECT	SPECIAL FEATURES ILLUSTRATED.	ANIMAL.	METHODS EMPLOYED.
Fabric fibres, etc.	Wool.		A_1; f_4.
	Cotton.		
	Linen.		
	Silk.		
	Rabbit's hair.		A.
	Human hair.		
	Air bubbles.		
	Oil droplet.		
Vegetable cells.	Cells in onion leaf.		A.: (1) f..; a ; b_{12}; afterwards b_9.. (2) f..; g_{12}.
	Cells in potato, cell contents.		A_3; f_6; b_{17}; afterwards b_9..
	Cell division in onion tip.		D_6; E_2; F_{10}; I_1; G_{16}; H_1; K_5.
	" " in fritillaria.		D.; E.; F_{10}; I.; G_{16}; H_1; K..
Animal cell.	Saliva and scraping from cheek.		a..; afterwards b_{15}.
	Echinoderm ova—fertilized (1–16 cell stages).		D_{15}; E_2; k_2.
	Early embryonic cells :		
	in (1) cross section 1 day chick.		D_{10}; E_1; G_7; F_{10}; i_1; b_7; k_5.
	(2) " " 3 day "		D_{10}; E_1; G_7; F_{10}; i_1; b_7; k_5.
	Cell division in tongue.	Newt.	D_6; E_2; F_{10}; I_1; G_{16}; H_1; K_5.
	" " in testicle.	Mouse.	D.; E.; F_{10}; I.; G_{16}; H_1; K..
	Centrosome and attraction-sphere.		Demonstration.
	Amitotic cell division.		Demonstration.
	Altmann's granula.		Demonstration.
Epithelium.	Shed skin—squamous epithelium.	Frog.	E ; f ; afterwards g..; h_1; k..
	Cornea of embryo.	Pig.	A_1; f ; afterwards g_{17}.
	Cornea.	Dog.	B_3; f_4; k_2.
	Transitional epithelium of bladder.	Dog.	B_3; f_1; k_3.
	Columnar epithelium and goblet cells, intestine.	Human.	B.; f_1; k..
	Stratified epithelium of skin.	Human.	B.; f_1; k..
	" " " mouth.	Human.	B.; f_1; k..
	Ciliated epithelium of bronchi.	Human.	B.; f_1; k.
	Epithelium in section of cornea.	Rabbit.	D_{11}; E_2; F_9; g_2; b_1; k_5.
	" " " " small intestine.	Dog.	D_{11}; E_2; F_6; g..; h_1; k..
	Living ciliated cells.	Oyster.	A_1; f_2.
	" " "	Frog.	Demonstration.
	Glandular epithelium—kidney.	Dog.	B.. ₁₅; f_1.
	" " liver.	Dog.	B.; f_1.
	Frozen section—kidney.	Dog.	F.; a_5.
	Pigmented epithelium of retina.	Dog.	B_3 for 2 days; f_4; k_2.
	Lens fibres.	Dog.	B. for 2 days; f_1; k..
Connective tissues.	Mucoid tissue, section umbilical cord.	Human.	E_1.; F_6; g.. ₁.; k..
	Fœtal conn. tissue, tendon.	Embryo pig.	B.; f_1; g.₁; k..
	Endothelium, mesentery.	Rabbit.	A_1; g.; e.. ; h_1; k..
	Subcut. areolar tissue.	Rabbit.	A_1; I..; f ; afterwards g_1.; k..
	White fibrous tissue, tendon.	Dog.	B.; G.; f_1; k..
	" " in corium of skin.	Human.	D_1; f..; g.. ₁.; k..
	Conn. tiss. corpuscles of cornea.	Rabbit.	G_{26}; f_9; b_1; k_5.
	Cornea in frozen section.	Dog.	F..; a_5; afterwards g_{17}.
	Pigmented conn. tiss. cells in penis.	Terrapin.	E.; F_6; g.. ₁.; k..
	Mastzellen stained with " polychrome " methylene blue.		Demonstration.
	Yellow elastic tissue in lig. nuchæ.	Ox.	A_1; f_6; afterwards g_{18}.
	Membrane of elastic fibre—contents.	Ox.	B_{11}; f_1; g_{18}.
	Elastic membrane—artery.	Dog.	A_1; f..
			B_2; f_4.
	Reticulum—lymph gland.	Dog.	F ; B_6; f.; g.₁
	" " "	Dog.	F.; b_{22}.
	Gelatine manufacture.		Demonstration.
	Chemical reactions of the connective tissues.		Demonstration.
Cartilage.	Simple cellular.	Embryo pig.	A_1; f_6; a_5; afterwards g_{17}.
	Hyaline—general structure in rib.	Ox.	A_1; f..; a ; afterwards b_{19}.
		Ox.	A_1; f_1; g_{12}.
	on articular surface.	Ox.	A_1; f_1; b_{14} for glycogen.
	White fibro-cartilage—intervertebral disc.	Dog.	A_1; f_1; b_{17}.
	Yellow elastic cartilage in ear.	Dog.	D_{10}; E_2; F_6; g.. ₁; k..
Smooth muscle.	Cells in tunica muscularis of intestine.	Dog.	A_1; f_5; a_5; afterwards g_{17}.
	Cells in tun. musc. of pregnant uterus.	Pig.	B_9; f_4.
	Embryo smooth muscle.	Pig.	E_1; f_1; g_4.
	Piece of wall of distended bladder.	Frog.	D_1; g.. ₁.; k_2.
	Section of smooth muscle-intestine.	Dog.	(Already prepared under epithelium.)
Voluntary muscle.	Appearance of fresh tissue.	Frog.	A_1; f_4; a_5; afterwards g_{17}.
	Dissociated fibres.	Dog.	B_2; f_4.
	Muscle from embalmed subject.	Human.	Muscle from dissecting room; f_4; k_2.
	Muscle-fibrillæ.	Frog.	E_7; E_2; f_4.
	Cohnheim's fields.	Insect, dog.	G_{26}; E_2; F_{10}; i_1; k_5.
	Embryonic fibres.	Pig.	B.; f_1.

Subject.	Special Features Illustrated.	Animal.	Method Employed.
The neurone.	Cell elements in adult spinal cord.	Ox.	A; g.
	Cell elements in spinal ganglion.	Dog.	B; G; f.
			D, for ¾ hour; glyc. + ac. acetic, for from 3 to 4 days; f₁ (Schiefferdecker, p. 227).
	Cells in sympathetic ganglia.	Frog.	D, for ¾ hour; glyc. + ac. acet. for 3 days; f₄.
	Examples in embryo spinal cord.	Pig.	E; G; F; H.
	Section of spinal ganglion.	Dog.	D₆; E₂; F₉; G.; k₃.
	Section of cervical sympathetic ganglion.	Dog.	D; E.; F.; G.; k.
Nerves.	Fresh sciatic nerve.	Dog.	A₁; b₁₁.
	Ranvier's silvered nerve.	Dog.	G₂₀; expose to light; f₄.
	Silvered nerve.	Dog.	Vide article by Golgi, Nervensystem, p. 63.
	Osmic preparation.	Dog.	B₁; f₄.
	Axones.	Dog.	½ per cent. osmic 4 hours; 90 per cent. alc. 24 hours; wash in H₂O; sol. ac. fuchsin 24 hours; abs. alc. 3 days; toluol; celloidin.
	Axones.	Dog.	E₄.₂; F₉; g₂₆.₁₆; h₃; k. (Strobe).
	Fresh splanchnic nerve.	Dog.	A₁; f₄.
	Cross section of sciatic nerve.	Dog.	E.; F.; g.
	Cross section of splanchnic nerve.	Dog.	E.; F.; g.
Nerve endings.	Motor endings in vol. muscle.	Frog.	May's method.
	Free nerve endings in epithelium of cornea.	Frog.	G.; E.; F.; h.;
	Pacinian corpuscles.	Cat.	A₁; a.; afterwards b₁₅.
	Meissner's corpuscles.	Human.	D.; F; g; h.
	Nerve endings in frog's tongue, pig's snout and human skin, with vital methylene blue staining.		Demonstration.
Blood.	Fresh blood from ear.	Human.	⎫
	" " " frog.	Frog.	⎬ Test with b₁₄; b₁₅; b₁.; b₂.
	Technique of fresh blood slide.	Human.	A.
	Blood platelets.	Human.	Prick finger through g₂₀ (1–100,000).
	Fibrin.	Human.	Coagulation beneath cover-glass.
	Fibrin in tissues stained with Weigert's fibrin stain.		Demonstration.
	Blood of other animals.	Bird, Dog, Cat, Rabbit.	Demonstration.
	Technique of Ehrlich's method of drying and staining, and the varieties of white corpuscles in the blood.	Human.	D₁; g₂₁; k₃.
	Nikiforoff's method.	Human.	D.; g.; k.
	Nuclei of white corpuscles.	Human.	Blood mixed with drop of D₆.
	Eosinophiles in horse's blood; iron in eosinophile granules; mastzellen; myelocytes.		Demonstration.
	Hæmoglobin crystals.	Rat.	Blood made laky and then placed in stoppered bottle to crystallize.
	Hæmin crystals.	Human.	NaCl + HC.H₃O₂ (glacial) and heat.
	Mastzellen in tongue.	Dog.	D₁; F₉; g₁₉; k₃.
	Hæmoglobinometer, Hæmocytometer, Hæmatokrit.		Demonstration.
	The circulating blood in mesentery and tongue.	Frog.	Demonstration.
Heart.	Dissection of heart.	Sheep.	A; f.
	Fresh elements of heart muscle.	Sheep.	B.; f₁.
	" " " "	Human.	F; a.
	Purkinje fibres.	Sheep.	A₁; f₄.
	Cross section of papillary muscle.	Dog.	L₄.₂; E.; F₉; g.₁₅; k₃.
	Section of heart wall and mitral valve.	Dog.	L.; F.; f.
	" " " " aortic valve.	Dog.	L.; F.; F.
Arteries, veins and capillaries.	Dissection of walls of medium-sized artery. Portions dissected off to be examined microscopically.	Dog.	B₆; f₄.
	Cross section of aorta.	Cat.	D.; E.; F₉; g₁₆; h₁; k₃.
	" " " femoral artery and vein.	Cat.	D.; F.; F.; g.; h₁; k.
	Capillaries from pia mater.	Human.	D.; F.; a.
	Silvered mesentery.	Cat.	g.; h; f (20) k.
Lymph glands and lymphatics.	Cross section of thoracic duct.	Dog	D₁; E.; F₉; g₁₆; k₃.
	Sagittal section of lymph gland.	Ox.	D₁₁; E.; F.; g.₁₅; k₃.
	Injected lymphatic gland.	Dog.	f; F; F; h; k.
	Unstained lymph gland.	Dog.	A₁; F₁₁.
	Framework.		Cf. mounted section of reticulum.
Spleen.	Appearances in gross.	⎧ Human ⎨ Pig.	A₁. A₁.
	Fresh scraping from surface.	Pig.	A.; f.; a. nigrosin h.
	Smear cover-glass preparation.	Pig or human.	D.; h. stain scan drying...
	Section.	Human.	D.; E.; F₉; g₆; h₁; k₃.
	Injected organ.	Dog.	f.; F.; h; k.
	Framework.	Dog	Demonstration of reticulum.

SUBJECT.	SPECIAL FEATURES ILLUSTRATED.	ANIMAL.	METHODS EMPLOYED.
Bone.	Architecture of femora.	Human.	Dried bone sawed through longitudinally.
	Elements of bone marrow.	Dog.	A_1; a_3; afterwards g_{17}.
	Elements of marrow.	Dog.	d_1; f_{15}.
	Section of marrow.	Dog.	D_1; E_1; F_{9}; i_1; g_{-1}; k_9.
	Longitudinal section of decalc. bone.	Dog.	L_{-}; E_3; C_1; F_{9}; g_{-13}; k_9.
	Cross section of decalc. bone.	Dog.	E_3; C_1; F_{9}; b_{-4}; g; k_9.
	Longitudinal and cross section dried bone.	Human.	Demonstration; also with polarization microscope.
Developing bone and muscle.	Finger.	Human fœtus.	E_1; C_1; F_{9}; g_{-1}; k_9.
Tendon and muscle as organs.	Injected blood-vessels in muscle and tendon.	Rabbit	L_{-1}; E_3; f_{10}; h_1; k_9.
	Cross section of tendon.	Dog.	E_1; F_9; F_9; g_4; k_5.
	Nerve endings in tendons and muscles.		Demonstration.
ALIMENTARY TRACT.	Dissection of alimentary tract from mouth to anus.	Embryo pig.	A_1; f_{11}.
Mouth and tonsil.	Section of lip.	Baby.	E_{-}; F_{9}; g_{-1}; k_9.
	Section of palatine tonsil.	Human.	D_{11}; E_1; F_9; g_{-1}; k_9.
	Blood-vessels of tonsil.	Cat.	L_1; E_5; G_1; F_9; h_1; k_5.
Tongue.	General structure in longit. section.	Rat.	E_1; F_9; g_{-1}; k_9.
	Tip of tongue and filiform papillæ.	Human.	D_1; F_9; g_{-1}; k_9.
	Side of tongue.	Human.	D_1; F_9; g_{-1}; k_9.
	Vallate papillæ and tonsilla lingualis.	Human.	D_1; F_9; g_{-13}; k_5.
	Papilla foliata.	Rabbit.	D_6; E_2; F_{10}; g_{16}; h_1; k_5.
Teeth and salivary glands.	Parotid gland, resting.	Rabbit. }	D_1; E_1; F_9; g_{-1}; k_9.
	Parotid gland, active.	Rabbit. }	
	Submaxillary gland.	Human.	D_{11}; E_1; g_{-1}; k_9.
	Sublingual gland.	Human.	D_1; E_1; F_9; g_{-1}; k_9.
	Adult tooth, longit. section.	Human.	f_{13}; k_5.
	Developing tooth in lower jaw.	Embryo pig.	E_1; C_1; E_1; F_9; g_{-11}; k_9.
Oesophagus and stomach.	Cross section œsophagus—upper part.	Human. }	E_1; f_{10}; g_{-1}; k_9.
	Cross section œsophagus—lower part.	Human. }	
	Longit. section and blood-vessels of œsophagus and cardiac end of stomach.	Cat.	L_1; E_5; G_1; F_9; k_5.
	Longit. section through whole stomach.	Rat.	D_1; E_1; F_9; g_{-1}; k_9.
	Section of cardiac end.	Dog.	D_{11}; E_2; F_9; $g_{7\ 13}$; k_5.
	Section of middle region.	Dog.	D_{11}; E_2; F_9; $g_{7\ 13}$; k_5.
	Section of pyloric end and beginning of duodenum.	Dog.	D_{11}; E_2; F_9; $g_{7\ 13}$; k_5.
	Secretion-canaliculi on parietal cells.	Dog.	E_{10}; G_{-}; F_9; k_9.
Intestine.	Dissection and low power microscopic examination of layers of small intestine.	Dog.	a_1; f_{11}.
	Cross section of small intestine.	Dog.	E_1; F_9; g_{-1}; k_9.
	Longit. section through Peyer's patch.	Human.	E_1; F_9; g_{-1}; k_9.
	Blood-vessels and lymphatics.	Rabbit.	L_{-1}; F_9; k_9.
	Auerbach's plexus, } Meissner's plexus. }	Guinea pig.	G_1; f_{11}; k_9.
	Vermiform appendix in transv. section.	Human.	E_1; F_9; g_{-1}; k_9.
	Large intestine—cross-section.	Human.	E_1; F_9; g_{-1}; k_9.
	Longit. section through anus.	Baby.	D_1; F_9; $g_{7\ 13}$; k_5.
Pancreas.	General structure.	Dog.	D_1; E_1; F_9; g_{-1}; k_9.
	Blood-vessels.	Cat.	L_1; E_5; G_1; F_9; k_9.
	Finer cell structure—(Altmann's granules).	Cat.	Altmann's method.
Liver.	Lobular structure.	Pig.	D_1; F_9; g_{-10}; k_5.
	Lobular structure.	Human.	E_1; F_9; g_{-1}; k_9.
	Blood-vessels.	Rabbit.	$L_{3\ 4}$; E_5; F_9; k_9.
	Bile-capillaries.	Human.	E_{10}; G_{29}; F_9; k_5.
	Kupffer's cells.	Human.	F_9; B_{19}; G_{34}; k_1.
	Fresh tissue.	Human.	F_9; a_3.
	Embryonic appearances.	Embryo pig.	D_{11}; E_2; F_9; $g_{7\ 13}$; k_5.
Thyroid.	Section including so-called "embryonic nodule."	Dog.	D_1; F_9; $g_{7\ 13}$; k_5.
Thymus.	Section.	Baby.	D_1; F_9; g_{-10}; k
THE RESPIRATORY SYSTEM.			
Epiglottis, larynx and trachea.	Longit. section through the tissue.	Rat.	E_1; F_9; g_{-1}; k.
Lungs.	Dissection of trachea and lungs.	Embryo pig.	A_1; f_{11}.
	Elements.	Dog.	B_3; f_4; k_2.
	Section adult lung.	Human.	E_1; F_9; g_{-1}; k_9.
	Blood-vessels of lung—(section through root).	Dog.	L_3; E_5; F_9; k_9.
	Shaving of dried injected lung.	Dog.	L_1; E_1; F_9; k_9.
	Frozen section and elastic tissue.	Dog.	A_1; E_1; a_{-}; afterwards b_{-}.
	Development of lung.	Human fœtus.	E_1; F_9; g_{-1}; k.

Subject.	Special Features Illustrated	Animal.	Methods Employed
Genito-Urinary Organs.			
Kidney.	(1) Isolated units.	Dog.	E; f,.
	(2) Vertical section for blood-vessels. }	Cat.	L.; E; i; f; ...
	(3) Tangential section for blood-vessels. }		
	(4) Vertical section through renculus.	Human.	E.; F₈; g₇ ₁₃; k,.
	(5) Cell details in cortex.	Dog.	D.., E.; F₁₀; i₁; g₁₆; b₁; k..
	(6) Developing kidney.	Embryo pig.	D. E. f g ...
	(7) Appearance of fresh tissue.	Dog.	A. i k. afterwards g.
Ureter.	(1) Cross section.	Dog.	E. f g k.
Bladder.	(1) Section through walls of contracted organ.	Human.	E. f g k.
	(2) Section through wall of organ distended.	Dog.	O.. F. g. k..
Testicle.	(1) General structure.	Human.	E. F. g k.
	(2) Spermatogenesis.	Mouse.	D. F. i₁ g b.
	(3) Isolated tubules.	Dog.	B,; f,.
Semen.	Spermatozoa.	Human.	A. a. afterwards g.
Vas deferens.	Cross section.	Human.	E. F g k.
Prostate and pars urethra.	Section.	Human.	D. E F. ...
Vesiculæ seminales.	Section.	Human.	E.; F₉; g₇ ₁₃; k₃.
Ovary.	General structure in young adult.	Human.	E. F g ...
	Structure in pregnant animal.	Dog.	E. F. g k
	Blood-vessels in ovary and longit. section of Fallopian tube.	Cat.	L₁ ; F. F g ... k.
	Blood-vessels in ovary.	Human.	L₁ ₂; E₁; F₁₁; k₉.
Fallopian tube.	Cross section.	Human.	E. F g ...
Uterus and vagina.	General longit. "oversight" section.	Cat.	L.; E F g k
	Wall of body of uterus.	Human.	E F. g ...
	Longit. section of cervix, including cervical canal.	Human.	E. F. g k.
	Pregnant uterus (Decidua).	Human.	E₁₁; F₉; g₇ ₁₃; k₃.
	General structure of the placenta and its blood-vessels	Human.	L. E F g
	Cross section of vagina.	Human.	E. F g k.
Penis.	Transverse section.	Dog.	F₃; C₁; E₂; F₉; g₇ ₁₃; k..
	Transv. section adult.	Human.	E. F g k.
	Longit. section of glans and prepuce.	Human.	E. F g k.
Cowper's glands.	Section through penis and gland.	Human.	E. F g k.
Clitoris and urethra.	Longit. section bladder, urethra and clitoris.	Human.	E. F. g k.
Bartholine's glands.	General structure.	Human	E. F g k.
Adrenal.	General structure.	Human.	F F ...
Sense Organs.			
Skin.	Palm of hand.	Human.	D. F g k.
	Back of wrist.	Human.	D. F ...
	Finger tip.	Human.	D.; E.; F₁₀; i₁; g₁₆; b₁; k..
	Elements.	Human.	E.; f₁.
Eyelid.	General structure.	Baby.	E. F g ...
Lip.	Junction of skin and muc. memb.		Cf. alim. tract.
Skin.	Blood-vessels.	Human.	L. F. F. b₁₀ k
Nail.	Cf. also section of baby's finger showing developing bone.	Human	B.; f,.
Scalp.	Hairs and follicles.	Human.	E₁ ₃; F₉ (iodine-green method).
Hair.	Elements.	Human.	a₁ b₁₀; f₁.
Hair follicle.	Elements.	Human.	E. f days f.
Mammary gland.	General structure.	Human.	D₁ E g k.
Milk.	Elements.	Cow and human	a₁.
Nose.	General dissection of.	Embryo pig.	A₁; f₁₀.
	General structure of cavities and septum in vertical section.	Baby	E. E F ...
	Elements of mucous membrane.	Dog.	E. G. ...
	Section of mucous membrane.	Guinea pig.	D. E. O. F. i ...

Subject.	Special Features Illustrated.	Animal.	Methods Employed.
Nose.	Alæ nasi and respirat. muc. memb.	Baby.	$E_:F_:g_{.1}:k_.$
	Nerves in muc. memb., cribrif. plate and olfactory bulb.	Embryo pig.	$2(E_1, G_.)$; D_1; F_1; H_1; $K_.$
Eye.	General relations.	Pig.	$f_{11}.$
	Structure in horizontal section through cornea, lens, optic nerve, ciliary region and retina.	Guinea pig.	E_1; $E_.$; $F_.$; $g_{.1}:k_.$
Cornea.	Matrix—negative picture.	Rabbit.	Stick $AgNO_3$.
	Matrix—positive picture.	Dog.	$G_.$; $E_.$; $k_.$
	Nerves.	Embryo pig.	G_1; $D_.$; $F_.$; i_1; $g_:k_.$
Lens.	Fibres.	Cat.	$B_.$; separate capsule after 2 hours; return to $B_.$ for 24 hours; $f_.$; $k_.$
Retina.	Elements.	Pig embryo.	$D_.$; B_1, for 2 days; $f_.$; $k_.$
	Nerve elements.	Pig embryo.	G_{20}; D_{11}; F_{10}; i_1; g_2; $k_5.$
	Nerve elements.	Pig embryo.	$G_{.}$; F_9; $K_5.$
Eyeball.	Distribution of blood-vessels.	Cat.	$L_{1,2}$; E_2; F_9; h_1; $k_5.$
Lachrymal gland.	General structure.	Human.	D_{11}; $E_.$; $F_.$; $g_{.11}:k_.$
Optic nerve.	Structure in cross section.	Human.	$E_.$; F_9; G_{11}; H_1; $K_..$
	Long. section through optic nerve, chiasm, and optic tract.	Pig embryo.	$E_.$; $F_.$; G_{11}; H_1; $K_..$
Whole ear.	General relations.	Embryo pig.	a_1; $f_{11}.$
External ear.	Transv. section of soft parts of ext. auditory canal.	Human.	D_1; $f_.$; $g_{.1}:k_..$
Middle ear.	General structure.	Dog.	E_1; C_1; $E_.$; $F_.$; $g_{.1}:k_..$
Internal ear.	General view of cochlea, sacculus and semicircular canals.	Baby.	E_1; C_1; $E_.$; $F_.$; $g_{.11}:k_..$
	Cochlea—vertical section.	Guinea pig.	$D_.$; E_2; C_1; $D_.$; G_1; F_{10}; i_2; $k_5.$
	Nerves and nerve endings at base of skull.	N. born mouse.	$2(E_{10}; G_{20})$; D_1; F_9; H_5; K_5; (cf. v. Lenhossek).
	Nerves and nerve endings.	Guinea pig.	Retzius' method (cf. Böhm and v. Davidoff, p. 372).
Central Nervous System.			
Embryonic nervous system.	General form—relations of central nervous system in advanced embryo.	Embryo pig.	$f_{11}.$ (To be preserved in formaline and used for reference throughout the course.)
	Transv. section—1 day chick.	Emb. chick.	Cf. sections given for study of animal cell.
	" " 3 " "	Emb. chick.	
	Longit. section young pig embryo.	Emb. pig.	D_{10}; $E_.$; $F_.$; $g_{.1}:k_..$
	Transv. section through region of third ventricle.	Emb. pig.	D_{10}; $E_.$; $F_.$; $g_{.1}:k_..$
Spinal cord.	Structure in transv. section and technique of Weigert's stain.	Dog.	E_1; F_9; g_{10}; h_1; $k_5.$
	Another section in Upson's carmine.	Dog.	E_1; F_9; $g_.$ over night; $k_5.$
	Transv. section cervical enlargement.	Human.	E_1; $F_.$; G_{11}; H_1; $k_.$
	" " thoracic cord.	Human.	" "
	" " lumbar cord.	Human.	" "
	Longitudinal section cervical cord.	Human.	" "
	(a) laterally.	Human.	" "
	(b) through mid. of hemisphere antero-posteriorly.	Human.	" "
	Transv. section below hemi-section.	Monkey.	$E_{1,11}$; E_2; F_9; h_1; $k_.$
	" " above hemi-section.	Monkey.	$E_{4,11}$; E_2; F_9; h_1; $k_5.$
	" " asc. deg. after section of post. roots.	Monkey.	$E_.$; $E_.$; $F_.$; h_1; $k_.$
	" " descending degeneration.	Human.	E_1; F_9; G_{11}; H_1; $K_5.$
	" " ascending degeneration.	Human.	E_1; F_9; G_{11}; H_1; $K_5.$
	Study Golgi cord.		Cf. section given for study of neurone.
	Frozen section spinal cord.	Dog.	A_1; $F_.$; $a_4.$
	Structure of nerve cells in cord.	Dog.	D_1; F_{12}; G_{20}; H_7; $K_7.$
	Cord of fœtus nearly full term to show non-medullated pyramidal tracts.	Human.	E_1; F_9; G_{11}; H_1; $K_5.$
Myelencephalon and nerves directly connected with it.	Two transverse sections.	Adult human.	$E_{.,.}$; F_9; $G_.$; $k_.$
	Six transverse sections.	Adult human.	$E_{8,4,3}$; F_9; G_{11}; H_1; $K_5.$
	Sec. through decussation of pyramids, after extirpation of thumb area in cortex.	Monkey.	$E_.$; $F_.$; H_1; $K_..$
	Longitudinal section through pons and medulla.	Adult human.	$E_{8,4,3}$; F_9; G_{11}; H_1; $K_5.$
Metencephalon and nerves directly connected with it.	Four transverse sections at different levels through pons varolii.	Adult human.	$E_{8,4,3}$; F_9; G_{11}; H_1; $k_5.$
	Tr. section through pons in region of sup. olivary complex.	Cat.	$E_{.,.}$; $F_.$; G_{11}; H_1; K
	Section of cerebellar cortex, including dentate nucleus.	Cat.	$E_{.,.}$; $F_.$; G_{11}; H_1; $K_..$
	Finer structure of cerebellar cortex.	Cat.	F_9; $G_.$; $F_.$; $h_.$; $k_.$

SUBJECT.	SPECIAL FEATURES ILLUSTRATED.	ANIMAL.	METHODS EMPLOYED.
Mesencephalon, Diencephalon and nerves directly connected with them.	Section through inferior colliculi corp. quad.	Human.	E.; F.; G.; H.; K..
	Section through superior colliculi corp. quad. including tegmentum, subst. nigra, cerebral peduncles, corpora mamillaria, optic tract, pulvinar and corpora geniculata.	Human.	$E_{5,4,2}$; F_9; G_{11}; H_1; K_5.
Diencephalon, Telencephalon and nerves directly connected with them.	Ten coronal sections for macroscopic study through hardened half brain, respectively, 30, 46, 55, 63, 69, 75, 86, 92, 107 and 137 mm. behind frontal pole.	Human.	E.; F..
	Horizontal section for microscopic study including parts between wall of third ventricle and cortex of island of Reil.	Human.	E.; F.; G.; H.; K..
	Coronal section for microscopic study through thalamus and hypothalamus, including nucleus hypothalamica (Luysi),	Human.	E.; F.; G.; H.; k..
	Sections of cortex for microscopic study : (1) Upper part of gyrus centralis anterior. (2) Middle third of gyrus temporalis superior. (3) Cuneus adjacent to calcarine fissure. (4) Gyrus fornicatus. (5) Ammon's horn and nucleus amygdalæ. (6) Substantia perforata anterior. (7) Gyrus frontalis inferior (pars opercularis). (8) Gyrus angularis.	Human.	E.; F.; G.; H.; K.. E.; F.; G.; H.; k.
	Finer structure of cortical substance.	Human.	E_6; $G_{..}$; $F_.$; h.; k..
	Lobus olfactorius.		
	Transv. section.	Human.	E_4; F_9; G_{11}; H_1; K_5.
	Transv. section.	Rabbit.	E.; G..; F.; h.; k..

THE PHOTOGRAPHIC ROOM AND APPARATUS IN THE ANATOMICAL LABORATORY OF THE JOHNS HOPKINS UNIVERSITY.

By A. G. HOEN, M. D.

The scope of photo-micrography can conveniently be divided into photo-micrography (1) with high powers, (2) with medium powers, and (3) with low powers.

(1) Photo-micrography with high amplification (600 to 1200 diameters) is employed chiefly for the delineation of pathological material, such as micro-organisms, free and in sections of tissues, malarial and leukemic blood, etc., as well as for the demonstration of some of the minuter histological changes which occur in the cells, such as karyokinesis; the demonstration of nerve terminations in the tissues, as well as for the finer histological structures in general.

(2) Photo-micrography with medium amplification (150 to 400 diameters) is applied to tissue work, where it is desirable to differentiate structural elements in pathological as well as in normal histological material, micro-urinary deposits, and the study of vital movements (amœboid) of certain cells by serial exposures. Under this heading it is perhaps well to enter our criticism in reference to the illustrations as found in the various text-books on normal histology. Beautifully as the majority of them are executed, we cannot help but point out their deficiency in properly conveying to the student's mind the correct appearance of the microscopic image or field. It has become a fixed fact in the minds of instructors that teaching histology from drawings and diagrams is by no means altogether satisfactory. Most of the diagrams are selected from exceptionally fine or lucky specimens, and many of them are composite pictures, taken from different slides, the salient points of one being blended with those of others, thus making perfect pictures which have a tendency to puzzle the student, because he cannot verify them from his sections. The diagrams are intended to elucidate the subject, and if

they are accompanied with photographs they aid markedly in giving the student the proper impression of the subject at hand, nothing more or less; whilst on the other hand a drawing, no matter how carefully and conscientiously conducted, has constantly mixed with it a certain element, individualism, personal equation, if one chooses, which cannot be eliminated or ruled out. Furthermore the draughtsman never thinks of portraying the imperfections, bubbles of air, dust, cotton fibers, etc., which are likely to be present, even in the best preparations. The very perfection of his drawing is misleading and incorrect.

With a view to eliminating these difficulties, we have made in connection with the histological course, a series of well executed photo-micrographs, taken from the best specimens as prepared and stained by the students themselves. From these photographs lantern slides have been made for projection on a screen. For lower powers than 150 diameters, the specimen itself is utilized for projection by a system of lenses to be described further on.

(3) Photo-micrographs with low powers (from 2 to 10 diameters) applied for the purposes of studying various tissues with reference to their anatomical relations and for injected specimens of whole organs. Also extremely useful in embryological research, as where a few more fixed of great service as a time-saver to give correct outlines for reconstructions. The above uses of photo-micrography have been kept in mind in purchasing and elaborating the apparatus in the Anatomical Laboratory. Primarily the apparatus was intended for scientific investigation, but in the course of time it was found extremely useful for making a call. We shall describe our apparatus under the following heading.

The Rooms.—In constructing the rooms we were guided by the idea that the operator should work within the camera, so we made the main room perfectly dark. This communicates with a room for illuminating purposes on one hand and with a second dark room for developing on the other hand. Of these three rooms, the larger one contains the tables carrying the condensers, microscope, camera and projecting apparatus, whilst the smallest, well lighted one contains the electric arc light and tables for ordinary microscopic observation. The second dark room contains the necessary chemicals for developing plates and conducting such other manipulations as appertain to photography. It is supplied with hot and cold water and is lighted by incandescent lamps, one of which is hooded with black velvet over a frame of asbestos and the lower end is covered by three thicknesses of deep ruby glass. The accompanying figure shows the floor plan of these rooms with some of the apparatus in place. The walls and ceiling of the large room are painted a dull or flat black from which no reflection can take place. The windows are protected against the admission of light by venetian blinds on the outside, an adjustable black cloth one on the inside, and over these, sliding paneled wooden blinds. The inside blinds are also painted black, and are provided with screw clamps for taking up warps in the wood and to ensure perfect contact of their surfaces.

The table bearing the condensers, light filter and microscope is so placed that it directly faces the aperture in the partition, through which the light from the electric arc lamp is projected by the paraboloid reflector to be mentioned further on. The table bearing the camera is so placed that it forms a continuation of the first; both tables are brought into the same plane by means of set-screws.

The tables and camera were made by Zeiss, but we found it necessary to add these set-screws to adjust them to a given plane easily. On the north wall, directly opposite the opening in the partition, a plaster of Paris screen has been made, which is perfectly smooth to ensure a good reflecting surface. This screen is employed to receive the projected image, with low powers, for demonstrating histological specimens themselves to the classes. In addition to this it was found necessary to have a smaller movable screen constructed, which is also adjustable vertically, its use being to adjust the apparatus easily to any given number of diameters in making diagrams and reconstructions.

Illumination.—Sunlight is perhaps the one source of illumination that every photo-micrographer has tried some time in the course of his work, and has been glad to abandon for any new illuminant which would give him practically the same actinic power. There are, however, so many drawbacks to it that it is necessary to observe the time of the year, the day, the hour and the condition of the atmosphere as factors which determine the power of his light, not to say anything of the many disappointing days when it does not shine at all. In our laboratory sunlight has been entirely superseded by the electric arc light, with which we are capable of accomplishing everything desired. The lamp used is the ingenious invention of Coerper, of Ehrenfeld, Germany, and manufactured in America by the Helios Electric Light Co. of Pennsyl-

vania.* The lamp we employ is calculated to be of 4000 candle power, and is run by an alternating current of 30 amperes, and is in no respect dangerous to life. The construction is extremely simple. A glance at Fig. 4 shows the carbon holders balanced by means of a chain over a pulley in the lamp mechanism. As a result of this arrangement with the alternating current, the combustion of the carbons is compensated for by the descent of the upper and the ascent of the lower carbon in exactly the same ratio, and the arc is thus fixed practically at one point, and remains there from the time the current is turned on until the carbons are consumed. We found it necessary to substitute for the upper porcelain reflector one made in the form of a paraboloid, which completely encloses both carbon points. Our reflector is made of one piece of copper, lined on the inside with a thick coating of white lime, and our experience with it convinces us that it has very markedly increased the power of the light. In order to easily adjust the lamp in the optical axis of our photo-micrographic apparatus, we adopted the plan of mounting it on a mechanical stage, made much after the pattern of that employed on the better class of microscopes. This frame is attached to the wall in an upright position, thus giving both vertical and lateral movements, and we find that it works admirably, and is capable of adjusting the lamp to the fraction of an inch. These alterations and modifications were made by Messrs. Murrill & Keizer of Baltimore, to whom we are very much indebted for advice and suggestions in reference to the same. In attaching the parabolic reflector to the lamp, the carbon points were made to pass through two openings in it in order to keep them in place. Experience showed us, however, that there was considerable vibration of the two points in spite of this, which we overcame by attaching a guard to the side of the lamp, to steady the upright rod of the lower carbon point. This guard is adjustable with a screw, as the figure shows. With these adjustments we succeeded in attaining a source of light which is not continually moving up and down, as in the case of the lamp furnished by Zeiss. The heat generated by this lamp is considerable, and it was found necessary to protect the mechanical stage and the surrounding woodwork by asbestos sheeting.

Apparatus and Accessories.—The apparatus consists of a Zeiss stand I^h for photo-micrography with 2, 2.5, 4, 8, 16, 35, and 70 mm. lenses and Nos. 2 and 4 projection oculars. In addition to these lenses, there are also the following photographic lenses which can be used for photographing with low powers as well as for ordinary lantern projection :

Anastigmat 1: 6.3, focus 43 millimeters.
    1 : 7.2,   "   96   "
    1 : 7.2,   "   148   "
    1 : 12.5, "   260   "
    1 : 18,   "   632   "

With these lenses it is possible to photograph objects from one diameter upwards, and this is very necessary, for it is often desired to obtain a specific enlargement of a specimen, as in reconstruction work.

In addition to these lenses there is a complete projection table

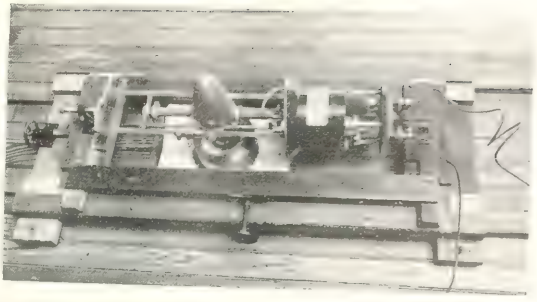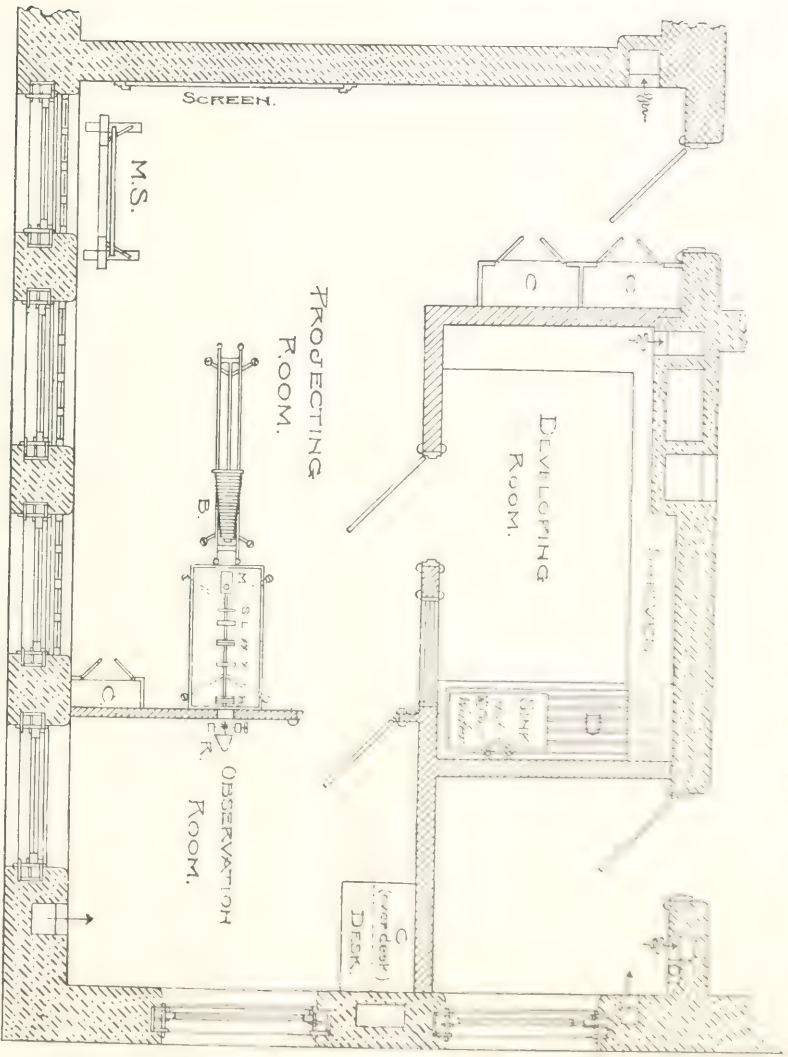* McKay-Howard Electric Construction Co., Baltimore, Md.

Fig. 1. Helios Electric Lamp Attached to the North Wall of the Observation Room. The position of the lamp is indicated by the • on the ground floor plan.

ANATOMICAL LABORATORY
JOHNS HOPKINS UNIVERSITY.

PLAN OF PHOTOGRAPHING ROOM.

Feet 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11
Metres, 0.   1   2   3

Fig. 1.

C, Cases. *D*, Drip-board. *MS*, Movable screen. *B*, Bellows. *M*, Microscope. *S*, Specimen holder. *L*, Light filter. *sa*, Double convex lens. *i*, Plano-convex lens. *H*, Heat filter. *·*, Electric light. *R*, Reflector.

FIG. 2. SOUTH-WEST CORNER OF THE PROJECTING ROOM

Flash-light photograph. The light is in the next room as indicated in the ground door plan

FIG. 3. NORTH-EAST CORNER OF THE PROJECTING ROOM

The permanent screen is attached to the wall for ordinary projecting work with lantern lens of low power. The movable screen is employed when a definite number of diameters are desired, as in taking charts, bromides, or simple outline drawings upon wax paper. On the left of the figure is the camera which is an attachment attached to the Zeiss stand

with its appendages, as well as the large camera. For delicate work there is a spectral illuminating apparatus after Hartnack.

The anastigmat lenses are all interchangeable, and the large ones are fitted with a prism to photograph at right angles to the object, as is often necessary in photographing objects under fluids. The sub-stage of the condenser of the microscope is that constructed after the formula of Prof. Abbé, is achromatic and supplied with two iris diaphragms, by which the access and egress of light may be regulated to the requirements of the amplification to be used, or in other words, they permit the use of the entire aperture of the condenser or only fractional portions thereof, as the case may be. It is fitted with two adjusting screws, by which means the condenser may be accurately centered for the objective in use, and an even and uniform illumination of the field secured.

As two tables or stands are supplied with this apparatus, one bearing the condensers, light filter and sole plate for the microscope, and the other the camera, we found that it was impossible to bring both tables to an exact level with each other or to retain them there, in consequence of which it was also impossible to establish a perfect optical line between the former and the latter. We found an adequate remedy for this by having set-screws put into each one of the iron pedestals of the tables; these screws rest in small metallic discs, which are simply laid on the floor in their proper position. This improvement of the Zeiss table has been found very serviceable in leveling the tables from time to time.

Methods of Illumination for High and Medium Powers.— 1st Method: In order to illustrate this it is necessary to refer to Fig. 1. The star represents the arc light, the rays of which are received upon the plano-convex lens x, which is so placed that the arc is in its principal focus, thus rendering all rays passing through it, parallel. In their further course through the bi-convex lens xx the rays are brought to a focus, which is made to coincide, by adjusting this lens on the sliding bar, with the principal focus of the lower lens of the Abbé condenser in the microscope (M). The lower lens of the Abbé condenser renders the rays parallel, while its second lens converges them and brings them to a focus in the plane of the object, giving there a small but very bright image of the source of illumination.

2d Method: This consists in the use of a plano-convex lens of much shorter focus than the one supplied with the outfit. It was made for us by Messrs. Bausch & Lamb of Rochester, N. Y., and is mounted in a metal frame which is fastened to the wall, and by means of set-screws permits of perpendicular as well as lateral movements. The collar is also movable in the optical axis, so that the distance between the collecting lens and the light can be regulated with ease. The lens is four inches in diameter and its principal focal distance is five inches. Its adjustment for accurately focusing the lamp is accomplished by means of the set-screw, which is moved back and forth until a bright beam of light, not greater in diameter than the lens itself, is projected on the screen. Fig. 1 of the lamp shows the lens as having been pushed through the opening in the partition by means of the set-screw and in position for focusing the lamp.

In order to accurately center the Abbé condenser for the

objective system we have adopted the following plan: The condenser is racked down far enough to enable us to unscrew its top cap which carries the small, nearly hemispherical and the upper achromatic plano-convex lenses of the system. This discloses the iris diaphragm situated immediately below it, the aperture of which is now reduced to its smallest diameter by the regulating lever of this part of the condenser. The resulting small opening is now carefully brought into the focus of a weak objective (16 mm.) and a low eyepiece (No. 4), and by means of the centering screws attached to the condenser, lateral and vertical movements are imparted to the latter until the opening in the diaphragm occupies a central position in the visual field of the microscope. We may state here that all of our objectives are carefully centered to the optical axis by Zeiss' "sliding objective changer."

To center the source of illumination to the optical axis the following was found to be the speediest and most certain method in our hands: The lenses of the guide-bar as well as those of the microscope, including the Abbé condenser and eyepiece, are removed; a pin-hole diaphragm is now placed in an eyepiece (freed of its lenses), which is slipped into the tube of the microscope. By looking through the pin-hole opening in the blank eyepiece, the carbon points of the electric arc light (without current) can now be brought into view by means of the adjusting screws on the mechanical stage bearing the lamps, to occupy a position corresponding to the opening in the diaphragm in the eyepiece. Once so adjusted the lamp has a tendency to remain in this position, requiring perhaps one adjustment in the course of six hours use.

The lenses for rendering the light parallel and condensing it are now placed upon the guide-bar and so adjusted that a sharp and bright image of the burning carbons is projected exactly in the center of the lower iris diaphragm of the Abbé condenser, which is closed to its utmost for this purpose.

For very high powers (immersion systems) the whole aperture of the Abbé condenser is utilized by opening the iris diaphragms to their fullest extent; for medium powers about one half of this aperture is sufficient. We found in practice that the illumination of the object which gave the most clear and sharp picture visually also answered the best purposes for photography. To secure the best illumination, the condensing lens xx is moved back and forth upon the guide-bar until the projected image of the microscopic field upon the ground glass of the camera is brightest and most evenly illuminated, thus fixing the position for the lens xx, for the focus of this lens and of the lower lens of the Abbé condenser are now coincident.

Light Filter.— We hav co   n   e   us y c
bichromate of potash and sulphate of copper mixtur   as
recommended by Neuhaus in   his admirable work on Photo-
micrography (p. 64, 1890). It is made as follows:

Sulphate of copper, 115 grams.
Bichromate of potash, 5 grams.
Sulphuric acid, ? cc.
Water, from 500 to 1000 cc.

The most concentrated solution is applicable to specimens
stained very heavily with the various filters customarily used.

anilines, etc.) or for the reds, particularly safranin preparations. Eosin is a decidedly disturbing element in photomicrography, and unless it is very cautiously and lightly used, as a counter-stain to other dyes, produces an indefinable haze or indistinctness upon the plate which mars an otherwise good negative very much. As practically no heat rays permeate this solution, it answers the purpose of a heat filter thoroughly. The position of the light filter is of little moment, provided that the rays of light which pass through it are the only ones which reach the Abbé condenser.

Focusing.—With a camera length of 55 to 60 cm. we have rarely found it necessary to have recourse to any special focusing appliance; the fine adjustment is within reach of the hand, while watching the appearance of the image on the ground glass. The focusing glass we employ is an ordinary hand lens, with which most of our work requiring from 150 to 400 diameters is accomplished.

The plate for intercepting the image is made of finely ground glass, such as Zeiss supplies with his outfit. For bacterial work a plane glass screen is used in connection with Zeiss' focusing lens, which is adjustable to the eye of the operator.

When the long camera is employed we use the focusing rod and Hooke's key as furnished with the Zeiss outfit.

Plates.—After using the plates of a number of manufacturers, we have selected those made by the "Cramer Dry Plate Company" of St. Louis, Mo., as those which give us uniformly the best results.

They are orthochromatic in the widest sense, are very uniform, and the instantaneous or extra rapid plates made by this company are sensitive to an exquisite degree.* For bacterial work we use the latter (1000 to 1200 diameters), preferring the "medium" plates for histological purposes (150 to 400 diameters).

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* From two to five seconds exposure is sufficient to impress these plates, even under such great dispersion of light as takes place, for instance, with the 2 mm. immersion system of 1.40 N. A. The advantages of this short exposure are obvious.

The development of these plates is accomplished as advised by, and after the formula of the manufacturers (in their circular), by a combination of hydroquinone and eikonogen. Care is necessary in manipulating these plates in the dark room with reference to the light used, which must be of a deep ruby red and feeble, otherwise they will fog. It is safer to develop the plates away from the light, using the latter only occasionally to watch the progress of the development.

Determination of Amplification and Means of Measurement.—With the Zeiss system of objectives and projection oculars, we have adopted the plan as advocated by him in his "Special Catalogue," (p. 36), and also noted in Neuhaus' work before referred to (p. 72).

As Zeiss has adopted a nomenclature for his objectives and oculars by designating them by their focal distances, it is an easy matter to arrive at the magnifying power of any one combination of objective and projection ocular by having recourse to the following formula:

$$\frac{L}{O} \times P = x -$$ in that L represents the camera length, O the focal distance of the objective, and P that of the projection ocular.

If therefore an objective of 2 mm. focal distance and the projection ocular No. 4 be used in combination with a camera length of 550 mm., we shall have:

$$\frac{550}{2 \text{ mm.}} \times 4 = \frac{1100}{1} \text{ linear.}$$

In this calculation the reckoning must be made from the shoulder of the ocular to the ground glass or screen. In those instances where it is necessary to be extremely accurate in the measurements, the stage micrometer ruled in 10ths and 100ths of a millimeter is made use of. Reproduction $= x$.

Yet for accurate work it is always necessary to control by projecting a millimeter scale. These we have had ruled in square millimeters, in square tenths and hundredths. For careful reconstruction work this is very necessary, as a projected rule shows easily any irregularity in the amplification at the periphery of the field.

ADENO-MYOMA OF THE ROUND LIGAMENT.

By Thomas S. Cullen, M. B. (*Tor.*), *Instructor in Gynecology in the Johns Hopkins University,*
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Isolated cases of adeno-myomata of the uterus have been from time to time reported, and recently our interest in these cases has been awakened by the excellent work of v. Recklinghausen, " Die Adenomyome und Cystadenome der Uterus und Tubenwandung," and within the last few months we have had two cases in the Johns Hopkins Hospital.

While adeno-myomata of the uterus are not so rare, similar tumors of the round ligament have apparently never been reported.

Leopold described a cystic myoma of the R. ligament. The writer, after carefully examining the tumor microscopically, came to the conclusion that the cyst cavities were dilated lymph spaces.

Aschenborn, in a patient with phthisis, found a tumor the size of a walnut lying in the inguinal canal and springing from the R. ligament. It was a thick-walled cyst, and contained clear transparent fluid. The microscopic appearances were not described.

Coulson had a case closely resembling that of Aschenborn. Roustan describes a case observed by Duplay. Situated over the external ring was a tumor twice the size of a man's fist. This on section resembled a cystic testicle. Microscopically the solid portions consisted of non-striped muscle, adipose and connective tissue. Some of the cyst-like spaces were traversed by trabeculæ. None of the cavities presented any epithelial lining. The tumor was a myoma undergoing degeneration.
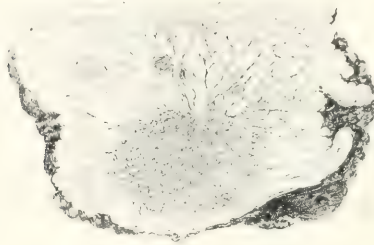
ADENO-MYOMA OF THE ROUND LIGAMENT.

Fig. 1.

NATURAL SIZE. LONGITUDINAL SECTION OF THE TISSUE REMOVED. THE UPPER PORTION IS SKIN. THE GREATER PART OF THE SPECIMEN CONSISTS OF LOBULES OF FAT. THE ROUND OR OVAL DARK AREAS IN THE FAT ARE HEMORRHAGES. SITUATED IN THE ADIPOSE TISSUE IS THE TUMOR, WHICH CONSISTS OF MUSCLE BUNDLES. SCATTERED HERE AND THERE THROUGHOUT THE MUSCLE ARE ROUND OR IRREGULAR DARK SPACES. THESE REPRESENT THE DILATED GLAND CAVITIES. RUNNING INTO THE MYOMA FROM ALL SIDES ARE STRANDS OF CONNECTIVE TISSUE.
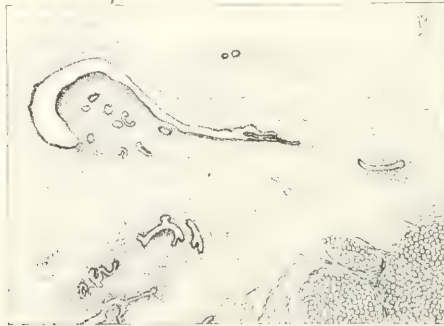
Fig. 2.

SIXTEEN TIMES ENLARGEMENT OF A PORTION OF THE ADENO-MYOMA. THE SPECIMEN CONSISTS CHIEFLY OF NON-STRIPED MUSCLE FIBRES. IN THE RIGHT LOWER CORNER ARE MASSES OF FAT CELLS. NEAR THE LEFT LOWER CORNER ARE SEVERAL FAT CELLS. IN THE VICINITY OF THE LEFT UPPER CORNER IS A PSEUDO-GLOMERULUS. THIS IS COMPOSED OF STROMA, SCATTERED THROUGHOUT WHICH ARE CROSS SECTIONS OF SEVERAL GLANDS. THE SURFACE OF THE GLOMERULUS IS COVERED BY ONE LAYER OF CYLINDRICAL EPITHELIUM. ITS CAPSULE IS COMPOSED OF ONE LAYER OF CELLS WHICH IN PLACES ARE CUBOIDAL OR ALMOST FLAT. THE CELLS OF THE CAPSULE HAVE PRACTICALLY NO UNDERLYING STROMA BUT LIE DIRECTLY ON THE MUSCLE FIBRES. THE SPACE BETWEEN THE PSEUDO-GLOMERULUS AND THE CAPSULE IS, ON TRACING IT TO THE RIGHT, SEEN TO BE CONTINUOUS WITH A GLAND CAVITY, AND IS NOTHING MORE THAN A DILATED PORTION OF THE GLAND. ABOVE AND TO THE RIGHT OF THE PSEUDO-GLOMERULUS ARE CROSS SECTIONS OF TWO GLANDS. BELOW IT ARE SEVERAL LONGI-TUDINAL SECTIONS OF GLANDS. ONE SHOWS DICHOTOMOUS BRANCHING. ALL OF THE GLANDS ARE SUR-ROUNDED BY STROMA, WHICH SEPARATES THEM FROM THE MUSCLE.

The above are the reported cases which at first sight might bear some semblance to the case I report.

Clinical History.

L. N., æt. 37, admitted in the service of Dr. Kelly, Oct. 18th, 1895.

The patient has been married 13 years; had one instrumental labor 7 years ago. Her menses commenced at 14, and were regular until the birth of the child, since which time they have occurred every 3 weeks, have been very copious, and have lasted from 4 to 5 days. The latter part of each period has been accompanied by a good deal of pain, which persists for several days after the flow ceases. Last menstrual period two weeks before admission.

Family History.—Her father died of paralysis; one aunt and her grandmother died of carcinoma.

Present Trouble.—About 8 years ago the patient noticed a slight swelling in the right inguinal region. This has gradually enlarged, especially during the last 2 years. She has experienced severe cutting pain in the nodule. The pain radiated to her back, and was most severe after exertion or at the menstrual period. The patient is debilitated; her appetite is moderate; bowels regular. She has a thick white or yellowish leucorrheal discharge. This is non-irritative, and is not offensive.

Vaginal examination is negative.

The mass occupies the upper part of the right labium. It is irregularly ovoid, and is firmly fixed in the deep tissue; it is, however, movable to the extent of 1 cm.

Operation by Dr. Kelly, Oct. 19, 1895.—An oval incision was made over the site of the nodule. The mass was freed laterally and posteriorly. Above, it was closely connected with a band of tissue 1 cm. broad. This proved to be the right round ligament. The round ligament was traced upward to the internal ring. Midway between the external and internal ring it contained a nodule 1 x .6 cm. in diameter. The round ligament was pulled down, clamped and cut off at the internal ring. Several enlarged lymph glands were then dissected out. The pillars of the ring were brought together by silver wire sutures. The round ligament was sutured into the canal. The canal throughout its entire extent was closed by mattress sutures of silver wire. The incision was then closed with catgut. The patient was discharged on Nov. 3d.

Anatomical Appearances.

Pathological No. 928. The specimen consists of a piece of tissue 7 x 4 x 3.5 cm. One surface of this is covered by normal skin, the underlying tissue is composed of fat, embedded in which is an exceedingly firm nodule 3.5 x 3 x 2 cm., Fig. 1. This nodule on section is composed of interlacing bundles of fibres which form a dense network. Scattered throughout the nodule are many small irregular, pale, translucent, homogeneous areas. On examining the specimen after hardening in Müller's fluid, some of the homogeneous areas are found to contain round, oval or irregular spaces. Accompanying the specimen are several lymph glands, one of which is 1 x .8 cm.

The nodule is to a great extent composed of non-striped muscle fibres which wind in and out in all directions, but do not show any concentric arrangement. In many places the muscle fibres are swollen, and the cell protoplasm contains large quantities of yellowish-brown granular pigment. At several points the muscle has undergone hyaline degeneration. This is especially noticeable around blood-vessels. The blood supply is abundant. Scattered here and there throughout the muscle substance are small islands of adipose tissue. *Traversing the nodule in all directions are glands,* Fig. 2. Some of these are small and round on cross section, others are cut lengthwise. These glands are surrounded by stroma similar to that of the uterine mucosa. It would be impossible to distinguish some of these from uterine glands. A few of the glands present slight dichotomous branching. Some of the glands contain round masses of protoplasm, scattered throughout which are several nuclei. These giant cells appear to be cross sections of tufts of epithelium.

In many places the glands present a peculiar arrangement and correspond to v. Recklinghausen's pseudo-glomeruli. These pseudo-glomeruli consist of stroma resembling that of the uterine mucosa. They contain numerous capillaries and may have one or more glands situated in their depth. In some places there is hemorrhage into their stroma. The pseudo-glomeruli are half-moon shaped, cone-shaped or irregular in contour. They are covered by one layer of cylindrical ciliated epithelium. What corresponds to Bowman's capsule consists of a layer of cells resting directly upon the muscle fibres. The cells of the capsule opposite the convexity of the glomerulus are almost flat; on passing off laterally they are seen to be cuboidal or cylindrical. The cells of the so-called capsule are directly continuous with those of the pseudo-glomerulus. The space between the capsule and the glomerulus may be empty; many, however, contain desquamated epithelial cells, some of which are vacuolated and contain brown granular pigment. Numerous spaces contain red blood corpuscles. On tracing one of the spaces laterally it is found to be directly continuous with the lumen of a gland. The capsule forms one wall of the gland and the pseudo-glomerulus the other, Fig. 2. In other words, the space between the capsule and the so-called glomerulus is nothing more than a dilatation of the gland cavity. In numerous places the gland epithelium on one side is found to be cylindrical, on the other side cuboidal or almost flat. On examining this more closely it is found that where the epithelium is separated from the muscle by a moderate amount of stroma it is cylindrical, but that where the epithelium rests directly upon the muscle it is invariably cuboidal or flat.

A few small glands are seen lying directly between muscle bundles. Extending into the myomatous growth from the periphery are numerous bands of connective tissue. The adipose tissue surrounding the myoma shows considerable hemorrhage. The skin covering the surface of the specimen is normal. The lymph glands, apart from being somewhat swollen, are normal.

Unfortunately we were not able to obtain the smaller

nodule of the round ligament for examination, and cannot say whether it was an adeno-myoma or not.

From a clinical standpoint the excessive pain in the nodule at the menstrual period is significant. It leads to the belief that there was some definite sympathetic relation between the uterus and the nodule in the round ligament.

Both v. Recklinghausen and I considered adeno-myomata of the uterus non-malignant, and the fact that the nodule in this case existed for eight years and increased very slowly, and at the operation showed no evidence of malignancy, strengthens our belief that these tumors are benign.

The only case in the literature that throws any light on this case is the one reported by A. Martin. A patient, æt. 70, consulted him about a rapidly growing tumor. He opened the abdomen and removed 12 litres of chocolate-colored fluid from the tumor which presented at the incision. This growth sprang from the left R. ligament, being connected with it by a pedicle. Pommorsky, who made the microscopical examination, found that the cyst containing the chocolate-colored fluid had very thin walls and that its inner surface was in places covered with clots. The pedicle of the tumor contained several small cysts which were filled with clear fluid and which communicated with one another. One of these cysts was lined by low cylindrical ciliated epithelium. Martin says that in this case the structure and contents corresponded to those of tumors arising from the parovarium.

ORIGIN OF THE GLANDS.

The glandular elements in our case correspond very closely to those found by v. Recklinghausen in adeno-myomata of the uterus. In those cases he was able to trace a marked resemblance between the tumor glands and remains of the Wolffian body, and came to the conclusion that the glands were derived from this source. While admitting the probability of the glands in our case being due to remains of the Wolffian body, we cannot, from their striking resemblance to those of the uterine mucosa, and from the fact that their stroma resembles that of the mucosa, refrain from suggesting the possibility that they may be due to an abnormal embryonic deposit of a portion of Müller's duct.

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A LIST OF SCIENTIFIC MEDICAL JOURNALS IN PUBLIC AND PRIVATE LIBRARIES OF BALTIMORE.

COMPILED BY MISS E. S. THIES.

This journal catalogue contains most of the periodicals contained in the libraries (see below) of Baltimore. In preparing this list it has been the aim to include only those journals and society proceedings which contain papers of scientific value. Although journals somewhat remote from scientific medicine and biology have been included in this list, many medical journals have been omitted. The list is primarily intended as a reference list; it does not contain the popular science journals nor journal sets, which are very fragmentary.

ABBREVIATIONS.

Anat.,	Anatomical Laboratory.
Biol.,	Biological Laboratory.
Chem.,	Chemical Laboratory.
Dr. Flexner,	Dr. Flexner's Library.
Dr. Halsted,	Dr. Halsted's Library.
J. H. Hospital,	Johns Hopkins Hospital.
J. H. University,	Johns Hopkins University.
Dr. Hurd,	Dr. Hurd's Library.
Dr. Kelly,	Dr. Kelly's Library.
Dr. Mall,	Dr. Mall's Library.
M. C. F.,	Medical and Chirurgical Faculty.
Dr. Osler,	Dr. Osler's Library.
Path.,	Pathological Laboratory.
Peabody,	Peabody Institute.
P. L.,	Pratt Library.
Phar.,	Pharmacological Laboratory.
Dr. Welch,	Dr. Welch's Library. F. P. MALL

A

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BULLETIN

OF

THE JOHNS HOPKINS HOSPITAL.

CONTENTS.

THE PRESENCE OF AN OIDIUM IN THE TISSUES OF A CASE OF PSEUDO-LUPUS VULGARIS.[*]

(PRELIMINARY REPORT.)

By T. C. Gilchrist, M. R. C. S., L. S. A., *Associate in Dermatology, Johns Hopkins University and Hospital.*
And William Royal Stokes, M. D., *Bacteriologist to the Board of Health of Baltimore.*

[*From the Pathological Laboratory of the Johns Hopkins University and Hospital.*]

In November, 1894, Otto Busse reported an extraordinary case to which he gave later the title of "Saccharomycosis Hominis." The case was that of a woman thirty-one years of age, who suffered from a localized sub-periosteal inflammation of the left tibia. This abscess opened spontaneously, and numerous doubly contoured, very refractive, roundish and ovoid bodies were found, situated both intracellular and extracellular in the pus and abscess wall, which were found by culture and by inoculation experiments in animals to be blastomycetes. Later the patient developed superficial ulcers on the face, subperiosteal swellings over the right ulna and the left sixth rib near the axillary line. Busse obtained pure cultures of blastomycetes from the ulnar swelling and also growths from the bottom of the ulcers. The case ended fatally, and the autopsy revealed purulent lesions in the kidneys, spleen and lungs, in all of which similar organisms were present in large number.

Busse found that these bodies grew on all ordinary media, and he carried out successful inoculation experiments in animals through three generations, thereby producing pathogenic lesions. In mice the inoculation of pure cultures caused death. The organisms were also found to produce fermentation in saccharine solutions, and were thus classed under the saccharomyces.

In May, 1894, six months previous to the publication of Busse's first article, one of us (Gilchrist) exhibited and described before the American Dermatological Association, at Washington, D. C.,[*] microscopical sections from a case which had been under Dr. Duhring's care in Philadelphia. Dr. Duhring described the case as a typical chronic scrofuloderma of the back of a man's hand. A portion was excised and was kindly sent to Gilchrist. In this tissue there were found large numbers of bodies which were round, doubly

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* Reference in Duhring's Text-book on Cutaneous Medicine, Vol.
I., p. 157.

contoured and refractive, and after the unstained sections were treated with liquor potassæ they appeared very distinct as against the blurred appearance of the tissue. The tissue consisted of very hypertrophied epidermis, throughout which were scattered numerous miliary abscesses, each one of which contained from one to nine of these bodies. The bodies varied from 10μ–16μ in diameter and contained a vacuole. Numerous budding forms were observed and the mode of development was found to be only by gemmation. They were seen to be both intracellular and extracellular, and were also scattered throughout the corium. In thin section the ordinary hæmatoxylin and eosin stain revealed their presence. No opportunity was afforded for making cultures or inoculation experiments, as the case was operated upon before the tissue was examined. The opinion was expressed by Gilchrist before the society that these organisms should be classed as belonging more to plant than to animal life. It was not until Busse's report appeared that these organisms were positively identified as blastomycetes.

Since 1894 a number of observers have been working on the pathogenesis of the yeast fungi, and particularly the blastomycetes. Both Sanfelice in Italy and Rabinowitch now in Philadelphia have done extensive and valuable experimental work on animals, and their results have been extremely interesting. Maffucci and Sirleo, Fermi and Aruch, and Tokishigi have found similar organisms causing pathogenic lesions in animals.

From a case of sarcoma of the mesenteric glands in a man, Corselli and Frisco obtained pure cultures of blastomycetes with which successful inoculation experiments were carried out in animals. Curtis, in France, also found a yeast fungus present in myxomatous tumors in the right groin and loin of a man, and he obtained pure cultures and also produced successful inoculation experiments. Charrin and Ostrowsky have described a case of a submaxillary abscess in a man where large numbers of the oidium albicans were found present in the pus. Finally, Roncali in a case of adenocarcinoma of the ovaries with metastases in the omentum found numerous bodies which showed an appearance like Sanfelice's blastomycetes, but no mention is made of cultures or inoculation experiments.

Through the courtesy of Dr. Halsted we are enabled to report a very interesting case of a cutaneous disease in a man. The patient is thirty-three years of age, married, about 5 feet 9 inches in height, and of slender but wiry build. He is one of thirteen children, twelve of whom are still living and in good health; one child died when five months old from whooping cough.

About eleven and a half years ago, three months before marriage, on July 4, 1885, the present eruption began at the back of the left ear, just behind the mastoid process, as a "pimple" which was about as large as a "grain of wheat," but it was roundish in shape and only slightly raised. The eruption began to spread in a linear direction towards the lobe of the ear, and very slowly, so that during the succeeding four or five years the length of the patch was only $1\frac{1}{2}$ to 2 inches. As the disease extended the oldest portion gradually healed spontaneously, so that a white, slightly hypertrophic scar was produced.

The healing process was always only partial and took years for its accomplishment. The linear scar which is now distinctly visible is about $1\frac{1}{2}$ inches long by $\frac{1}{4}$–$\frac{1}{5}$ inch broad. After four or five years the disease, which continued to spread very slowly forwards, reached the cheek, and then began to extend upwards and downwards, so that in seven years after the commencement of the eruption it had only reached the external canthus of the left eye, after which it continued to travel along both eyelids. The tendency to heal as it went along was still a characteristic feature of the disease, but the scar was now more atrophic, whitish and thin, particularly over the cheek. Besides extending to the eye, the disease also spread gradually down the left cheek until it reached the left side of the chin. In about nine years the nose was reached by the growing edge, then the bridge was soon crossed and the right eyelids and eyebrows became involved. After this the patient noticed that the growth now began to be much more rapid, especially on the forehead and down the right cheek.

About one month after the first lesion was observed there appeared on the back of the right hand, over the middle of the third phalanx, another "pimple" which soon became pustular and opened spontaneously. This lesion also began to spread slowly, but peripherally, and assumed the same characters as that on the face; it took about four years for it to spread over the whole posterior surface of the hand from the knuckles to the wrist and from the thumb to the inner margin of the hand. The eruption was treated with caustic by the family physician and this brought about its cure.

Another secondary lesion occurred six months after the first on the right side of the scrotum at the upper portion, and this again was characterized as a "pimple" which followed the same course as the others, except that it contained only a little pus, but the characteristic creeping propensities were shown till it reached about the size of a silver dollar. This scrotal lesion grew slowly for a year, when it healed spontaneously. No external applications were used.

Still a fourth lesion appeared in the same manner and at about the same time as the scrotal eruption, on the anterior surface of the left thigh and just above the internal condyle. This lesion also spread peripherally for about a year until it reached a patch 2 inches by $\frac{3}{4}$ inch in size, when it also healed spontaneously without treatment and left a slightly raised scar. On the back of the neck, just above the 7th cervical spine, a fifth lesion made its appearance a little later than the one on the thigh, and this continued to grow for two years, when it also healed spontaneously.

The patient says none of the lesions were at all painful.

Present condition.—On the face the diseased portion presents a distinct line of demarcation. The upper border, as shown in the crude sketch of the patient, extends from the middle of the right eyebrow directly upwards, and then extends across the forehead to the left side, where it curves down again to a point just outside the external canthus of the left eye. This border consists of a comparatively thin ($\frac{1}{8}$ inch wide), inflammatory, red ulceration which is superficial and covered with a scanty scab. Along the right eyebrow the characters of the lesion present a somewhat different aspect, viz. a firm papil-

lomatous appearance. These papillomatous growths can be separated, and sometimes a minute quantity of pus can be squeezed out from between them. Thin scabs were found partially covering these lesions.
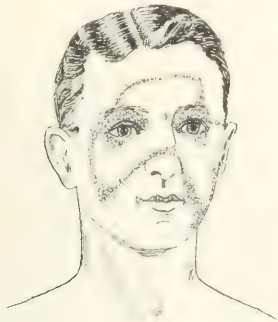
The right border of the facial patch extends from the right eyebrow horizontally outwards to a point within an inch of the ear, then it extends downwards and forwards towards the right angle of the mouth, and stops abruptly within half an inch of this point. The border of the patch then turns slightly upwards and inwards towards the ala of the nose. This right border is nearly an inch broad, and presents, especially towards the lower angle, a pronounced papillomatous character which is dry and scabby, and where it has encroached on the region of the beard it is pierced by hairs. The largest papillæ, which are all closely aggregated together, are about the size of a large pin-head, and sometimes a small quantity of pus can again be squeezed out from between the papillæ. The other portion of this border is covered with a thin scab, on removal of which a superficial ulcerative patch is exposed.

The continuation of the lower border extends across the nose within an inch of the tip as a superficial ulcerative edge.

From the left ala the lesion extends downwards to the left angle of the mouth, and from there it extends still further down to the border of the jaw, along which it continues upwards to the point of its first commencement. This margin also is about one inch broad, and again at the lower angle, i. e. between the mouth and the border of the jaw, the papillomatous character is well marked and pierced by numerous hairs. These enlarged papillæ are raised nearly ½ inch above the level of the normal skin.

The margin along the lower jaw is much narrower and superficially ulcerated.

The whole area enclosed by this irregular border consists of one continuous atrophic scar which is whiter than normal skin and thinner. The eyelids of both eyes are practically destroyed so that the patient cannot cover the eyeballs. Round the left eye the patch presents a raw, red, moist, easily bleeding surface, which extends for one inch downwards from the lower border of the eye. The right eyelids present similar appearances except that the lower patch is not so extensive. The tears from the eyes are continually running

over these patches, particularly on the left side. The patient says that the disease is not even now particularly painful.

On the back of the right hand is an atrophic thin whitish scar which extends over the whole surface of the dorsum. The scar on the right side of the scrotum is about the size of a silver dollar, is reddish and somewhat contracted, whereas the scar on the left thigh is smooth, thin, very white and not contracted. The lesion which was situated on the back of the neck has left a hypertrophic scar which presents a distinctly keloidal appearance.

There are no enlarged glands. The patient has no cough ; the bowels are regular, tongue fairly clean, and he says that he has always enjoyed good health. There is no history of syphilis, although the patient's wife had a 4 months miscarriage, but no children. The wife's courses are very irregular. No tuberculous history in the family could be obtained.

In making a diagnosis of this disease the first impression was that of lupus vulgaris, but on closer examination some peculiar features were seen which, with the history, did not confirm this diagnosis. The appearance did not simulate that of lupus papillomatosus, neither were any lupus nodules found in any portion of the lesion. Tuberculosis cutis, and particularly tuberculosis verrucosa cutis (Riehl and Paltauf), was then thought of, and clinically various points of resemblance presented themselves between this latter disease and our case. Tuberculosis verrucosa cutis begins as a papule which later becomes pustular, and after forming a scab, which falls off, a papillomatous growth is produced. This disease spreads very slowly peripherally, and on lateral pressure a little pus can be squeezed out from between the papillæ ; but the hands, forearms and feet are the only regions of the body where this disease has been found. The history of the lesion in our case and the fact that it healed spontaneously in three situations on the body is almost sufficient clinically to exclude tuberculosis of the skin in any form. Scrofuloderma was also thought of, but was excluded on the grounds that there were no enlarged glands and the entire absence of any other signs of this affection. In order to make a diagnosis of our case, two portions were excised, one from the right eyebrow and one from the right border of the patch on the face, for microscopical examination. One portion was dropped into 5 per cent formalin solution, and the other into 95 per cent alcohol.

Pathological Histology.—Unstained sections treated with ordinary liquor potassæ showed the presence of numbers of curious bodies which were doubly contoured and very refractive, whereas the tissue assumed a blurred appearance.

The stained specimens showed an hypertrophy of the epidermis, throughout which numerous variously sized well defined miliary abscesses were scattered. The epidermis was elsewhere considerably infiltrated with polynuclear leucocytes, and irregular masses of detritus were situated on the epidermis in places. Large collections of granulation cells were massed in the corium, and a few miliary abscesses were also observed in the upper portion of this region. A fair amount of inflammatory material was also distributed throughout the corium, and in a number of sections there was some evidence of the formation of tubercule-like nodules in the deeper portion of the corium. Situated in all the miliary

abscesses, and also among the granulation cells in the corium, were numbers of doubly contoured, refractive, round and ovoid bodies, varying in size from 10μ–20μ in diameter. Many of these forms presented buds of various sizes, and sometimes a vacuole was discernible, but this was not constant. The bodies were usually found singly, but they were sometimes arranged in groups. They were more numerous in the miliary abscesses than elsewhere. The contents of the bodies consisted of granular protoplasm which took up the ordinary stains. One of us (Gilchrist) who first observed these curious forms thought that they simulated very closely the blastomycetes which were found in the case already described by him, and therefore cultures and inoculation experiments were then carried out. In all the sections only a few giant cells were found, and it was only occasionally that one of the bodies was seen enclosed in a giant cell. The sections from the papillomatous growth did not differ materially from those already described, except that the papillæ were much hypertrophied, and sometimes a miliary abscess opened on the surface between the papillæ, which would explain the origin of the pus when pressure was made on them. Although numerous sections were stained for tubercle bacilli, yet none could be found.

Cultures. After sterilizing the surface of the papillomatous lesions, careful cultures were taken in two places from the pus which was squeezed out. Other cultures were taken from beneath the scabs, and also after excising a portion of the surface of the lesion.

The organism grew in pure culture from both of the tubes inoculated with the pus from two separate places, but those from the tissues contained a profuse growth of the pus organisms, and in only one instance a single large colony of the parasite developed.

The cocci from the tissues were not further noticed, as they were not present in the pus and could have no causal relation to the chronic process.

The morphology was first studied from portions of young colonies, and these fresh specimens were seen to consist of large refractive, oval or round bodies, showing a double contoured membrane suggesting an episporium and an endosporium, and containing numerous refractive granules resembling fat drops. These bodies often showed evidence of increase by budding, and at times the formation of short hyphæ. They possessed an average diameter of from 10μ–16μ, and closely resembled the bodies observed in the tissues. At times the granules within the protoplasm showed Brownian movements. They stained with the ordinary aniline dyes, the deeply staining membrane being separated from a central mass resembling a granular nucleus by a more lightly staining hyaline zone.

The development of this organism was observed by means of hanging drop cultures made from bits of colonies, and is as follows: From the round or oval bodies there occurs a growth of numerous long branching threads of mycelium, at first clear, but later containing numerous fine granules or larger round refractive bodies. At various points along the sides of these hyphæ numerous small knob-like projections of the limiting membrane occur, which gradually enlarge and at last

form large round cells or conidia. These either remain attached by means of narrow stems or sterigmata, or become free, and then greatly resemble the cells observed in the tissues and young colonies. These latter cells also frequently give evidence of increase by budding, and this is of interest in relation to the budding forms in the tissues. The growth in cultures is attended by the formation of envelope-shaped and dumbbell-shaped crystals of oxalate of lime.

The cultures grow most favorably on glycerin-agar and potato and are rather slow in developing. At the end of about 7 days numerous grayish-white colonies appear on the surface, which later become pure opaque white and develop numerous fine prickles, so that they resemble minute chestnut burrs. On potato this process continues until the growth becomes confluent and resembles a portion of the skin of a white rat stretched over the surface of the medium. A prominent characteristic of the growth is its firm adherence to the substratum, rendering it impossible to detach individual colonies without removing portions of the surrounding agar. Colonies also develop favorably on plain nutrient gelatine, 20 per cent beer-wort gelatine, plain agar, and 5 per cent beer-wort agar, bouillon, fluid beer wort, Dunham's solution, and milk: none of these fluids show any perceptible change, and no indol is formed. No alcoholic fermentation or the formation of any gas was observed after several weeks' growth in glucose, lactose and saccharose bouillon in the fermentation tube. Gelatine is not liquefied.

The animal inoculations with fresh bits of tissue consisted in the subcutaneous inoculation of one white mouse and one guinea-pig. The mouse died in 24 hours of a pneumococcus septicæmia. The guinea-pig has survived the inoculation for several months and shows no perceptible change. One guinea-pig inoculated with tissue in the peritoneal cavity by Dr. Flexner was killed at the end of 2 months, but showed no evidence of any disease except a few gray necrotic areas in the liver. The cultures were negative.

These inoculations are therefore only of negative importance, as enabling us in connection with the facts mentioned to rule out tuberculosis. Numerous attempts were also made to reproduce lesions in the skin of a dog from pure colonies by scarification and subcutaneous pockets, but with negative results.

A pure culture teased in salt solution was injected by Dr. Flexner into the external jugular vein of a dog under antiseptic precautions. During the space of about two months the animal seemed to become somewhat emaciated, but remained otherwise well. At the end of this time the dog was killed, and at the autopsy both lungs presented a striking picture. Projecting from the entire pleural surfaces there are a large number of generally discrete, pea-sized or larger, firm, light-yellow nodules. On section these extend for the distance of from $\frac{1}{2}$ to 2 cm. into the lung substance, and are yellow in color, but are dotted here and there with lighter, grayish yellow, softer, half-pin-head sized areas. These nodules are regular and round, and their circumferences are sharply marked out from the surrounding normal lung tissue. On section of both lungs, numerous similar bodies are scattered throughout the entire substance, but no cavities or large caseous areas were noticed.

The bronchial glands are enlarged, firm and light yellow on section. Nothing else of interest was noted. Bits of the lung nodules and bronchial glands were teased and examined fresh, and in both cases there were found very numerous, round, highly refractive bodies, with double contoured membrane and clear protoplasm. These bodies entirely resemble the original bodies found in the pus and in young cultures. Fresh sections of the lung hardened in 10 per cent formalin and then stained according to Flexner's method, show that these nodules consist of central large areas of coagulation necrosis, containing an occasional giant cell and much fat, and surrounded by a zone of large epithelioid and lymphoid cells, forming lesions of the general nature of pseudo-tubercles. The bodies mentioned above are seen as light blue round bodies, scattered for the most part throughout the necrotic areas. From the study of these bodies in fresh sections it is quite evident that there has been an extraordinary increase of them within the lung tissues.

From the lung nodules and bronchial glands pure growths of the same organisms were obtained on human blood serum, agar agar, and beer-wort agar. On this latter it was interesting to note that practically no mycelium was formed, but the colonies were whitish, dome shaped, smooth and shiny.

Further inoculations were made from the lung nodules of the dog into the peritoneal cavity of a guinea-pig, and also from pure cultures from the nodules into the subcutaneous tissue of the neck of a horse. In about one month's time an abscess of the epididymis of the guinea-pig developed, and the pus contained numerous organisms similar to those inoculated. In about the same time a local abscess developed in the neck of the horse at the point of inoculation, and a large number of the organisms were found, but no pus cocci. Cultures from the abscess contents showed a pure growth of the oidium.

It is interesting to note that these organisms produced lesions in animals similar to the cutaneous lesions in the patient, i. e. the production of miliary abscesses and the formation of tubercle-like nodules. A number of other animals have been inoculated, but the results from these experiments will be reported later.

The development of mycelium and distal and lateral cells or conidia, and the failure of the organism to cause alcoholic fermentation, have led us to classify the parasite as an oidium, a subdivision of the class of true fungi, and separated from the blastomycetes or yeast fungi. The entire absence of mycelium in the tissues would at first sight suggest that the organism in the tissues and that in the cultures are not identical. Brefeld, however, in his study of ustilago, a species of fungus causing the blight in many of our cereals, has pointed out that the spores alone are to be found at the seat of disease, and that a somewhat complicated cycle of development takes place elsewhere in nature, ending in the introduction of spores into other plants. This is true of many of the fungi.

Tokishigi has also studied an organism greatly resembling the one found in our case, which occurs in the nodular abscesses of a disease affecting many horses in Japan. Although he was unable to demonstrate any mycelium in the pus or tissues, he observed the growth of a well marked thallus in his cultures. These facts taken in connection with the occurrence of pure cultures of a fungus from the pus obtained from the cutaneous lesion on the patient in two instances, and the successful inoculations in animals (guinea-pigs, dogs and a horse), show that the organisms in the tissues and cultures are the same. We think that our organism differs from the numerous blastomycetes described by the authors cited above, in that it forms mycelium and does not ferment sugar.

In conclusion, therefore, we are of the opinion that this extensive cutaneous disease is caused by the presence and growth in the tissues of a species of oidium. Whether the organisms found in the case already recorded by one of us (Gilchrist) are the same as those found in this case will remain in doubt, although the similarity of the two organisms in the tissues is, to say the least, very striking. As far as we know this is the only example in literature of a pure cutaneous disease which has been shown to be caused by a species of oidium; and it is the third example where lesions of the human skin have been produced by organisms allied to the yeast fungi, Busse's case and Gilchrist's being the other two.

We take this opportunity of expressing our thanks to Professors Welch and Flexner for their advice and help in our investigations.

ON MOVEMENTS OF THE EYELIDS ASSOCIATED WITH MOVEMENTS OF THE JAWS AND WITH LATERAL MOVEMENTS OF THE EYEBALLS.*

By Harry Friedenwald, A. B., M. D.

At a recent meeting of this Society (October 7, 1895), Dr. Thomas presented a patient with unilateral congenital ptosis. In the course of his remarks he described certain associated movements occasionally seen in cases of ptosis, though the patient presented did not definitely show this peculiarity. In a conversation with Dr. Thomas I mentioned a number of cases which had come under my observation, some of the patients being under treatment at the present time, and at Dr. Thomas's kind invitation I have the honor to present a few to you this evening.

Quite a number of associated movements of the upper lids have been described; these vary greatly. In some, as in the cases referred to by Dr. Thomas, there was ptosis, but in others the same peculiar association of movement existed without ptosis. The lid movements occurred in some in association with opening and closing or with lateral movements of the jaws, in others they were associated with lateral movements of the eyeballs.

A. I shall first present a case of the former variety.†

C. D., female, aged 9, has normal eyes excepting slight hypermetropia. The movements of the eyeball are perfectly normal in every direction. There is no ptosis of either eye, but the right palpebral fissure appears on very careful examination to be a trifle smaller than the left, the difference being about 1 mm.

She was first brought to me by her mother, who complained that when the child ate, the right eye assumed a peculiar and repulsive appearance. This had been noticed since she was an infant. Giving her something to chew, especially when she is looking down, demonstrates the peculiar association of movement. It is seen that the right upper eyelid is drawn forcibly upwards only in lateral movement of the jaw and, what is most curious, only when the jaw is moved toward the same side as that of the eye. During protracted lateral movements the lid is spasmodically raised and soon assumes a condition of continuous contraction. These peculiar movements become less marked when the patient's gaze is directed forward, and are not at all visible when she looks upward.‡ Two similar cases have been reported (Gunn, Schapringer); in both there was ptosis, and lateral movement of the jaw produced elevation of the lid, but in both this was associated with a movement of the jaw toward the side opposite the eye; in other words, the levator palpebræ superioris was excited into action

by muscular effort of the pterygoid of the same side. The same relation existed in all those cases in which the eyelid was retracted both by opening the mouth and by lateral movements of the jaw. The case presented is unique in showing *association of the levator with the pterygoid of the opposite side*. (Demonstration of case.)

The second case which I wish to present is Miss R. S., aged 20; she was treated for slight error of refraction which produced asthenopia; there is slight drooping of the right eyelid.

When she eats, the right eye becomes widely dilated, 2 mm. at least of the sclerotic being thus exposed above the cornea. The lid is elevated only during lateral movements of the jaw, but I have not been able to determine whether it is the movement toward the same side or the opposite. Besides these defects there is slight crossed diplopia in the left portion of the field of fixation, with several degrees of vertical displacement, the image of the *right eye* being higher. She is positive in stating that the peculiar movements of her lid came on *not earlier than six years ago*. Unlike the other cases that have been described, this was not congenital. (Demonstration of case.)

B. We may next direct our attention to the association of movement of the lids with lateral movements of the eyeballs.

The published cases belonging to this category are as follows:

Case I.*—F. W. Browning (Trans. Oph. Soc., 1890, p. 187), male, aged 46. When he looked outwards, either to the right or to the left, the upper lid of the same side drooped, while the other was slightly elevated. The lid movement was more marked on the left side. When he converged strongly, both upper eyelids were simultaneously raised above the horizontal—the left most so. As he followed the descending finger, the eyelids followed the globes down to the horizontal, but there remained stationary. All extreme movements of the eye produced coarse nystagmus.

Cases II and III,* Dr. Sidney Philips (Trans. Oph. Soc., 1887, p. 306). Condition present in two brothers, aged 7 and 3 years. When the eyes were directed outwards, to the right or to the left, the upper eyelid of the other side drooped, that of the same side "remained raised."

Case IV,* Pflüger (XX. Congress of Heidelberg, S. 202). Female, aged 18. When looking to the left the palpebral aperture was wide open; looking straight forward produced a slight drooping of the right upper eyelid, while looking to the right brought on complete ptosis of the right eyelid. The patient could not overcome this ptosis voluntarily. Looking up (and to the right) did not alter the position of the eyelid. Strong movement to the left produced extreme opening of the palpebral aperture, which was maintained if the eye was likewise directed downwards.

The first to systematically study these cases was Fuchs

(Deutschmann, Beiträge zur Augenheilk., Vol. II, p. 12). He published eight cases. In three of these the lid was raised when the eye was abducted (Cases V, VI and VII).

Case V, male, 29 years; ocular movements normal. On looking directly forward no difference is noticeable in the palpebral opening on both sides, but when the right eye is adducted the eyelid droops. The affection was probably congenital.

Case VI, male, 45, syphilitic. Right eye: slight ptosis and paresis of the internal rectus, pupil dilated, and the accommodation paralyzed. This condition disappeared under treatment with potassium iodide, but at the same time the like affections appeared in the left eye. It was then that the left upper eyelid showed the associated movements under consideration —it was raised in abduction of the eye, but drooped in adduction. A year afterwards the ptosis had entirely disappeared, and likewise the associated movement. There was absolute paralysis of convergence (though the lateral movements were normal), the pupils were unequal and stationary, and there was paralysis of the accommodation.

Case VII, female, æt. 20. Paresis of the external recti muscles, especially of the right, and slight ptosis of both upper eyelids, slightest on the left side. (The ptosis on the left side soon disappeared.) In looking to the right, the eyelids remain in the same position, but in looking to the left the eyelids fall 2 mm. In convergence or when the eyes are raised or lowered there are no peculiar movements of the eyelids. In this case there was relaxation of the right lid in adduction, and of the left in abduction.

In five of Fuchs's cases the upper lid was raised during adduction of the eyeball.

Cases VIII, IX, X, XI, XII.—His five patients were all adults. In one only was the affection congenital. All had ocular paralyses (probably nuclear); three had paralysis of all the muscles supplied by one oculo-motor nerve, one of the superior rectus and levator palpebræ, one of the superior and internal rectus with slight paresis of the inferior rectus. In three of the cases the contraction of the paretic upper lid was so great during adduction of the eye that it rose higher than on the healthy side. Two of the cases showed contraction of the pupil during adduction, and in one there were interesting rhythmic associated movements of the lid and pupil. To these cases we must add the last one of Fuchs's mentioned under the former head of associated movements, in which the right lid relaxed in adduction, while the left relaxed in abduction.

These cases belong to the same class as those of Browning and Pflüger described above. They are the only ones that have hitherto been published. I shall add one to the list. (See Case XXIV.)

In 1893 we described two cases (Archives of Ophthalmology, Vol. XXII, p. 349), similar to cases of V, VI and VII (of Fuchs).

Case XIII, Miss S. W., æt. 11. The right eye appeared normal, but the left was smaller and lay deeper in the orbit. It was found that the movements of the left eye toward the nose were somewhat restricted, but that there was almost complete paralysis of the external rectus muscle. When the attempt is made to look to the left, the left upper lid is raised

so much that the palpebral fissure is as large as on the right side. If the eyes are turned to the right, the left palpebral fissure becomes very narrow. This patient had binocular vision when the eyes were directed forwards.

Case XIV, B. C., æt. 17, female, white. There was complete paralysis of the left external rectus with very slight convergent strabismus when looking directly forward. There was probably binocular vision. When the eyes are moved to the right or when the eyes are converged, the left palpebral fissure is much smaller than on the right side. On moving the eyes to the left (the left eye does not move beyond the median line), the left palpebral fissure becomes so wide that about 1 mm. of sclerotica is exposed above the cornea.

Sinclair (in the Ophthalmic Review for October, 1895) describes five cases in all respects similar to Fuchs's and my own (Cases V, VI, VII, XIII, XIV). These he has overlooked, stating that no cases similar to his own are on record.

His cases XV to XIX are all children; four are girls. In all of them the left eye is affected. The external rectus is paralyzed in all the cases; the internal is weak in three.

To these I wish to add the following, the first of which is here presented to you:

Case XX, A. V., female, aged 10. The patient has slight enophthalmus of the right eye and a rather high degree of hypermetropia, but otherwise the eyeballs are normal. In direct vision the palpebral fissures are about equal. The lateral movements of the right eye are very defective. Adduction is considerably impaired, the eyeball turning but slightly inwards, and moving in an upward direction when attempts at adduction are made. At the same time the enophthalmus is markedly increased. Movements inward and downward are not at all impaired. There is complete paralysis of abduction, the right eye not moving beyond the median line. There is no diplopia, and in direct vision it was shown that the patient had binocular vision.* This, together with the history furnished by the mother, proves that the condition was congenital.

The associated movements to be described are as follows:

The right palpebral fissure measures 6 mm., the left 8 mm. when she looks towards her left; attempting to look toward her right, her right palpebral fissure becomes 10 mm., the left remaining about the same. The difference becomes still more marked when the lateral movements are made in a plane below the horizontal; looking toward her left the right eye almost closes, the palpebral fissure measuring 2 to 3 mm.; looking toward the right widens the fissure to 8 to 9 mm. (Demonstration of case.)

A similar case is No. XXI. Miss ? V...... æt. 20, had a paralytic stroke when she was five years old. Up to that time her eyes were normal, afterwards her eyes were crossed; no diplopia. Paralysis of the external rectus of the left eye. When looking to her right, left palpebral fissure becomes smaller than the right; on looking in the opposite direction, the relative size of the palpebral fissure becomes inversed.

Case XXII is very interesting in other respects:

* Tests were made with the stereoscope and by means of Lippincott's method. Toward either side there was no binocular vision.

H. F., aged 19, complained that he was forced to move his head from side to side in reading. V. RE. is perfect; L. E. amblyopic. There was *complete congenital paralysis of abduction and adduction of both eyes*. Movement upwards and downwards perfectly normal. In attempting to look toward the right the left lid drooped somewhat, but was opened widely when looking in the opposite direction.

Case XXIII. Mrs. M. B., aged 59, fell when 18 months old and injured left eye. The left eye appears to be deeper than the right eye. There are several scars about the orbital region. The left palpebral fissure is 2 mm. smaller than the right in direct vision. Looking toward the right, both eyes move properly, but the left palpebral fissure becomes much smaller. Looking toward the left, we find complete paralysis of the left external rectus, and the left fissure becomes much larger than the right. There is no drooping in accommodation.

It is very curious that in almost all these cases it is the left eye that is affected. It is likewise remarkable that the great majority are females.

The next case is one in which the eyelid droops with abduction, and is raised in adduction, as in cases VIII, IX, X, XI, XII (of Fuchs).

Case XXIV. J. F., aged 35, has cerebral syphilis. The patient suffered a severe apoplectic attack four years after the secondary signs occurred. There was paralysis of the left leg and arm, and later the right leg and arm and the right eye were paralyzed. The right eyelid drooped and a high degree of divergence set in (ocular-motor paralysis). His condition gradually improved. When examined (September 6, 1894) we found in the right eye paralysis of the internal rectus (not complete, eye can be brought into median line by great effort), complete paralysis of the upward and downward movements. Movements outward normal. The left eye showed paresis of the internal superior and inferior recti; external rectus normal. There is no movement downward and outward in either eye, which would indicate paralysis also of the superior oblique. The levators are almost normal. When the patient looks to the right, the right upper eyelid droops, making the right palpebral fissure smaller than the left. When looking to the left, the right palpebral fissure becomes widely dilated, so that a part of the sclera is exposed above the cornea, while the left eyelid droops so far as to reach the upper margin of the pupil. Pupils are of medium size, do no react alike, the left seems to react slightly to accommodative impulses. Vision of neither eye greatly impaired (6/12, 6/9 without glasses).

From this list we see that there are eight cases (I, IV, VIII, IX, X, XI, XII, XXIV) in which the upper eyelid is raised in attempts at adduction and droops in abduction, and that there are on the other hand fifteen in which the opposite conditions prevail.

In one case (VII) there was relaxation of the right lid in adduction and of the left in abduction.

Taking the first set of cases into consideration, we find that six of the eight cases are males; that in five the condition was acquired, and in three it was congenital; in one there was no paralysis of the ocular muscles, in four the ocular-motor nerve was completely paralyzed; in one the superior and the

levator; and in one there was double oculo-motor paralysis; and in one both superior recti were affected.

In the last named case all external movements produced nystagmus.

In two of the cases the pupil contracted during adduction, and in one there were rhythmic movements of the lid and pupil.

In the second group of fifteen cases (in which the lid is raised in abduction and droops in adduction) six were males and nine females.

The condition was congenital in twelve, in two it was acquired in infancy; in the remaining case it was acquired after oculo-motor paralysis, and disappeared in a year. There was no paralysis in four cases; the external rectus was paralyzed in ten cases, and in four of these the internal was also paretic. In one case (Case XXII) both external and internal recti were paralyzed. The affection was limited to one eye, excepting in one case in which both eyes were affected.

In seven cases there was enophthalmus. In one of the cases there is a note that the drooping of the lid also occurred when the eyes were converged (Case XIV); while in another (Case XXIII) the adduction in convergence did not produce drooping, while adduction in lateral movements did.

In eleven cases the left eye was affected, in two the right eye, and in three both eyes. Finally there was one case (Case VII) which belongs to both classes. In this both external recti were affected, and there was slight ptosis.

It is evident that while the oculo-motor nerve is the one paralyzed in the first class of cases, it is the abducens which is chiefly affected in the second class.

No satisfactory explanation of these conditions has been given. It is probable that when acquired after paralysis they belong to the same category as those associated movements observed in hemiplegia. For the larger number, the congenital cases, we may assume the existence of abnormal relations of the cerebral nuclei and association fibres, but this is only restating the question.

C. The following cases are of interest as showing the closer association between the superior rectus and the levator than between the two levators.

Mrs. E. H., aged 44. Ten years before examination paralysis of left leg and arm, and later of the right leg. At the same time paralysis of the right eye. At the time of examination the patient was able to walk, but dragged the right leg. There was diabetis insipidus. The right eye showed complete paralysis of superior and inferior movements; there was slight ptosis of the left upper lid. Looking forward, the left fissure is 2 to 3 mm. narrower than right. Looking down, the *left eye does not follow the movement of the right, but remains looking directly forward and the eyelid remains open.*

R. W., male, aged 21, colored. Left convergent strabismus since childhood of very high degree. Movements of this eye are peculiar; they are limited to an upward and inward movement. When the patient looks down with the right eye the left eye looks forward and slightly inward, and *the upper lid remains raised*, even when the right eye looks downward to that degree that it is almost closed.

Neither of these patients has any difficulty in opening or closing the eyelids.

THE ABORTIVE TREATMENT OF ACUTE SUPPURATIVE ADENITIS OF THE GROIN BY PRESSURE BANDAGE.*

By A. BRADLEY GAITHER, A. M., M. D.

The frequency with which the complication of acute suppurative adenitis of the groin is present in cases of urethritis and chancroid, and the very unsatisfactory results of treatment instituted to check the process, should make any procedure which holds out even a fair chance of success, most welcome. When used for abortive treatment, applications of iodine, mercurial ointment, belladonna ointment, etc., have given practically no results, while injections of solutions of bichloride of mercury or carbolic acid are painful and liable to set up a great deal of inflammation. There is also the risk of infecting the bubo, the contents of which are always absolutely free from germs. In the hands of some operators gratifying results have been obtained from injections, but as a rule they have been discarded as unsatisfactory. In fact, all the abortive methods having been found wanting, it has become more and more popular with surgeons to abandon such treatment altogether, and to endeavor to bring the condition to an operative stage as soon as possible.

Dr. Lydston advocates "the early and complete extirpation of all bubos." He claims that "when suppuration has begun in the glands, and this suppuration begins early, even as soon as the third day, the inflammation extends to the peri-glandular tissue; and then the case becomes long and obstinate, from the continued suppuration."

Dr. Edward Martin says that "in the treatment of bubo the best results in the long run would be obtained by immediate incision of the glands as soon as they become markedly inflamed, and closure of the resulting wound by suture. It is a good rule to attempt the abortion of a bubo not longer than three days. If no good results follow in this time, suppuration will almost certainly occur."

Such had been my opinion before using the pressure bandage abortive treatment, but on account of the results obtained from a series of cases, I would now advise putting on a pressure bandage, regardless of the age of the bubo, if suppuration has not advanced to such a degree as to bring the case practically to the operative stage.

The bandage is applied as follows: A piece of cotton as large as the fist is folded in on itself again and again until it has the shape of the bubo, and when placed on it does not completely cover it. This is carefully adjusted, and a wad of tightly compressed cotton as large as a cocoanut placed over it. Small pieces of cotton are also used on the inner and outer surfaces of the thigh, to prevent chafing. A very tight spica bandage is then put on.

The amount of pain experienced by the patients varied greatly. In some cases the pressure did not seem to increase it at all. In fact, the relief of pain has been, in most cases, remarkable.

One man with a large bubo in each groin had suffered a great deal and had been unable to work for three weeks previous to applying for treatment. Two days after the double bandage had been applied he returned to his work, that of a laborer, and continued the same without interruption while the bubos were being aborted. In almost every variety of treatment for bubo, the point insisted on is rest in the dorsal decubitus position. While wearing the pressure bandage this is by no means imperative, though it is to be preferred. If the bandage remained in position 24 hours, even if the gland went on to suppuration, the pain would be diminished.

In the series of cases reported here, which were treated in the genito-urinary clinic of the Johns Hopkins Hospital Dispensary, the bandage was used regardless of the condition of the bubo or the apparent hopelessness of success.

Eighteen cases were treated, four of which were practically in the operative stage when the bandage was applied, and three of the four showed no improvement.

In two cases the men were unable to keep the bandage on more than a few hours, saying that the pain, already great, became unbearable.

Of the remaining twelve cases, the bubo was aborted in nine, including two which seemed to be so far advanced as to leave no chance of success. The earlier the bandage was applied the better was the termination, and if treatment was begun before any sign of suppuration could be made out, a satisfactory result was obtained in more than 85 per cent. of the cases.

In estimating this percentage it must be held in mind that in a certain proportion of cases a bubo will subside while we are doing our best to hasten suppuration. I recall the case of a man who had a bubo in each groin, one of which had reached the operative stage, while the other was not quite so far advanced. In order that both might be incised at the same time, he was advised to apply a poultice and come back in three days. He kept poultices continually on each bubo, and on his return it was found that suppuration was being checked on both sides, and eventually he recovered without operative interference. The notes on four of the cases treated are as follows:

Case I. F. R., white, age 2[?] [illegible] Patient has had discharge from urethra three weeks. Has had two attacks of urethritis. Now has no pain on micturition, or increase in frequency. Discharge is thin and serous. There is a barrel-shaped induration extending 2 centimetres along the frænum. Some preparation made and no organism found. Examination with microscope reveals ulcer in fossa navicularis, extending from [?] centimeter from meatus almost to meatus. Ulceration is most marked on upper right side of urethra, but extends completely around same. Treatment: Irrigations of bichloride of mercury [?].

November 7, 1895. Condition same.

November 13. Has inflammatory bubo in right groin, duration 4 days. Size of hen's egg. Skin covering swelling bright red. No sign of suppuration. Very painful. Patient can hardly walk. Treatment: Pressure bandage.

November 18. Bubo much improved. Redness and swelling less. Gland is hard and almost painless. Continue bandage.

December 2. Gland is smaller, hard and painless. Stop bandage. On December 16 a macular eruption appeared on hands and wrists, later over abdomen, and patient is now under treatment for syphilis, with no further trouble from bubo.

Case II.—W. L. W., age 45, white, November 21, 1895. Patient has had discharge from urethra 15 days. First attack. Pain on micturition during first five days; none at present. No increase in frequency of micturition. Glands in left groin slightly enlarged. No pain. Treatment: Lafayette mixture.

November 27. Patient returns with inflammatory bubo, left side. The glands are matted together. Slight redness and tenderness. No suppuration. Treatment: Pressure bandage. The bandage was renewed from time to time, and on January 7, 1896, the glands were hard, painless, and gradually being absorbed.

Case III.—A. P., colored, age 24, December 27, 1895. Patient has had bubo, left side, 3 weeks. Says it was preceded by two small discharging sores on either side of the frenum, which can still be seen, but have almost healed. There is a large inflammatory bubo in left groin; glands are matted together and show evidences of suppuration over one small area. Skin covering swelling is adherent and glistening. Treatment: Pressure bandage.

January 2, 1896. Bubo smaller and harder. No further sign of suppuration. Continue bandage.

January 7. Slight evidence of bubo. Swelling in groin not painful. Stop bandage.

Case IV.—C. B., white, age 18, November 16, 1895. Has had discharge from urethra 3 weeks. First attack. Some pain on micturition and increase in frequency. Discharge profuse and purulent. Treatment: Injection bichloride of mercury $\frac{1}{20000}$. Has inflammatory bubo, left side, size horse-chestnut. Skin covering swelling red. Considerable pain on pressure. No evidence of suppuration. Treatment: Pressure bandage.

November 21. The glandular enlargement in left groin has almost disappeared. No evidence of suppuration. Continue bandage.

November 27. No sign of inflammation about inguinal glands, which are now slightly enlarged. No pain. Stop bandage.

The patient continued under treatment for urethritis until December 24, without any sign of a return of the bubo.

In several instances the tightness of the bandage caused œdema of the penis by interference with the circulation, which readily subsided when the pressure was relieved. In a case of double bubo, when the bandage was left off for one day on account of œdema, there was in that time marked evidence of a return of suppuration, which had apparently been checked.

The bandages were renewed in from four to eight days, and the patients were able to continue work without inconvenience. If the abortive treatment did not prove successful, the bubos were much larger than they would probably have been had they not been kept under pressure.

In one case, in which the bubo was incised under ether after the pressure bandage had been worn 8 days, the glands were found hard, matted together, and without suppuration at the top, but at the very bottom some pus was discovered. It seemed that the suppurative process had been checked from above downward and had almost stopped. It is probable that had the bandage been persisted in a few days longer there would have been no necessity for an operation and absorption would have taken place.

It can be said in favor of the pressure bandage treatment for acute suppurative adenitis of the groin:

1. It is safe.
2. Pain is, as a rule, diminished after 24 hours.
3. It does not prevent the patient from pursuing his usual occupation.
4. It gives a high percentage of successful cases.

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TWO RARE CASES OF DISEASES OF THE SKIN.

By T. C. Gilchrist, M. R. C. S: L. S. A.

[Exhibited before the Johns Hopkins Medical Society.]

I.—Lymphangioma Circumscriptum.

The first case is that of a young girl, 13½ years of age, who came to us in our dispensary clinic about three months ago. The family history did not reveal anything bearing on the disease.

The following history of the present lesion was obtained from the mother; when the patient was only eighteen months old, a small patch of eruption was first noticed on the outer side of the left thigh just below the left great trochanter, and the eruption consisted of a group of thick clear "blisters" (so the mother says), some of which were very dark colored (hæmorrhagic). Neither pain nor swelling accompanied the eruption. The patch at first was about the size of the palm of the hand, but as time went on it increased very slowly in size, until the patient was eight years of age, when she met with an accident (a fall on the affected side) which resulted in an injury to the cutaneous lesion and the deeper tissues.

Suppuration followed, and a large abscess resulted which included not only the patch but a portion of the thigh below. After suffering locally and constitutionally for some time, the patient was brought to the hospital for surgical treatment and was operated upon. On looking up the report of the case, it was found that an incision 7 inches long had been made over the abscess, which was cleaned out and an elliptoidal portion of skin was removed, and the resulting wound was sewed up. A note was made about the thickened skin, but no mention of vesicles or any particular cutaneous lesion was reported. The girl left the hospital cured of the abscess six weeks later. Previous to the accident the patient's health had always been good. The mother now says that, after the operation, where some of the original patch of eruption had not been removed, the "blisters" increased rapidly in number and extent, especially over the region of the scar and surrounding area. This second rapidly appearing lesion presented the same characteristics which distinguished the original patch.
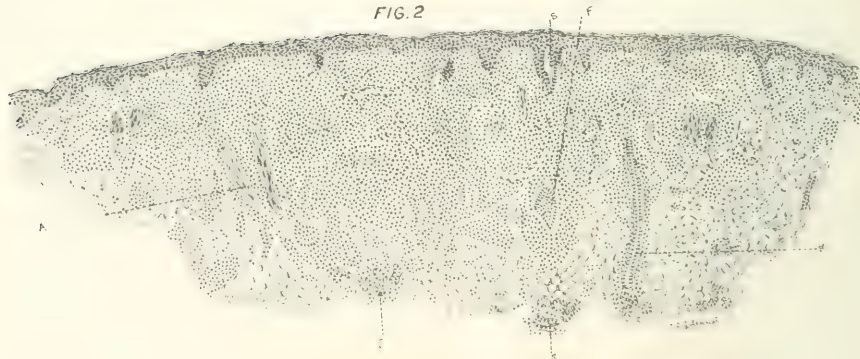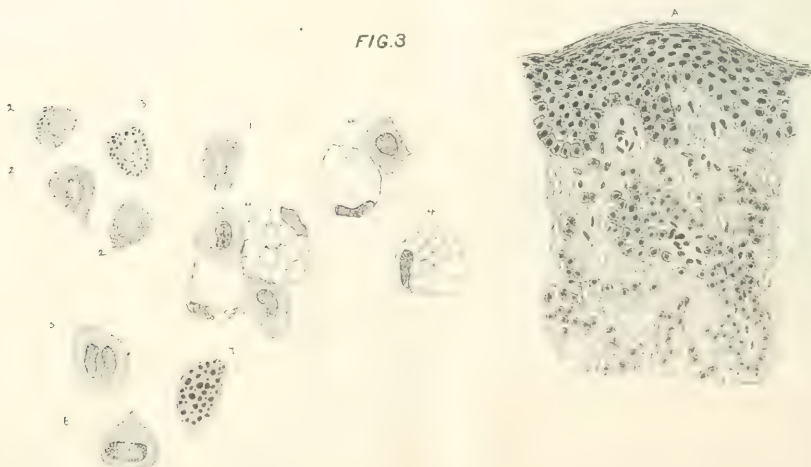
FIG. 1

FIG. 2

FIG. 3

FIG. 1.—LYMPHANGIOMA CIRCUMSCRIPTUM. A section of vesicle. L—Lymphatic dilated. C—Capillaries. V—Blood-vessels. G—Sebaceous gland. S—Sweat gland.

FIG. 2.—URTICARIA PIGMENTOSA. Section of nodule from arm of a child (16 months old). A—Arrectores pili muscle. F—Part of hair follicle. S—Sweat duct and glands.

FIG. 3.—URTICARIA PIGMENTOSA. 1—Mastzell in normal skin. 2—Mastzellen in centre of growth. 3, 6 & 7—Mastzellen showing deeper stained and larger granules. 4—Varieties of fatty infiltrated mastzellen. 5—Mastzellen with two nuclei. A—Small portion of larger drawing magnified.

Present condition.—From the history, therefore, the duration of this eruption is twelve years, and it has shown itself to be exceedingly chronic in course. The lesion, as you can now easily see, occupies the greater portion of the external surface of the left thigh. Extending from the great trochanter directly downwards for eight inches is a firm, indurated and very thickened, broad hypertrophic scar, which has resulted from the operation above mentioned. The whole eruption appears to be situated around the region of this scar. When the patient first came to the dispensary three months ago, the entire patch was very much inflamed, and covered here and there with crusts and scabs. She also complained of great pain, which was so severe at times that she could not sleep, and thus her general condition fell very much below normal. The present condition of the eruption is now much better than when we first saw her, and her general health is also good. All the local inflammatory symptoms have been removed by means of external applications. The eruption, as you observe, extends above the upper end of the scar, and also reaches laterally to the middle of the anterior surface of the thigh, but posteriorly it only extends about three inches beyond the scar. This whole patch is larger at the lower end than at the upper. The largest portion, of which the scar forms, as it were, the center, is thickened, indurated, very firm, raised, and presents a typical warty appearance. The color varies from deep red to purple in the older patches, but is whitish in the most recent lesions. The eruption may be described as consisting of three varieties. The most recent variety, of which many examples are seen along the margin of the patch, consists of almost pin-point to large pin-head sized clear vesicles, arranged usually in small or large groups and situated on perfectly normal skin. The smallest examples of this variety, being of the same color as the normal skin, are very difficult of detection. The second variety, which is perhaps the commonest, consists of large pin-head to almost split-pea sized vesicles which are particularly thick walled, and cannot be ruptured by friction. They are distributed in large groups and are discrete and confluent. They have not only a distinctly warty appearance, but also present a warty feel. The third variety are the hæmorrhagic vesicles. Even some of the smallest lesions contain exceedingly minute hæmorrhagic points, but the hæmorrhages have mostly occurred in the larger vesicles.

On incising any of these varieties of vesicles, a thin fluid exudes, which is clear in the non-hæmorrhagic variety.

We have excised a number of the various lesions of all sizes and stages, and the result of our observations confirms the diagnosis of lymphangioma.

Three or four of the excised portions were thrown into a formol solution (6 per cent) as a fixing agent, and the usual hardening process with alcohol was carried out afterwards. In a section of one of the first variety, viz. two very small raised vesicles, one could easily distinguish the enlarged superficial lymphatic vessels (*L*, Fig. 1) from the capillaries (*C*, Fig. 1) which were filled with red blood corpuscles (stained red with eosin). Fig. 1 represents a section of one of the smallest vesicles which was situated on perfectly normal skin. All the varieties of vesicles were found to consist not only of dilated but also hypertrophied lymphatics of the papillary (principally) and middle layers of the corium. The epidermis (Fig. 1) over the vesicles was thinned mechanically. Although the papillæ were thus occupied by the dilated and hypertrophied lymphatic vessels (*L*, Fig. 1), which were twisted and of an ovalish shape, yet the adjoining capillaries (*C*, Fig. 1) were only slightly dilated. Throughout the whole section signs of inflammation were absent, but in the region of the corium beneath the adjoining unaltered papillæ were to be seen numerous round mononuclear cells, especially round the vessels. The dilated lymphatics (*L*, Fig. 1), which were lined with endothelial cells, were filled chiefly with fine coagulated albumen, but a few lymphocytes were also seen in some of the sections. The lining endothelial cells showed slight bulging into the lymph cavities.

Sections from the second variety showed more advanced stages than the first, and here inflammatory symptoms sometimes accompanied the marked dilatation and overgrowth of the superficial lymphatics. A number of lymphocytes, mononuclear leucocytes and transitional cells were found in the larger lymphatic vesicles, even when no inflammation was present. The collection of mononuclear cells in the corium beneath the vesicle was immensely increased. In the largest cavities only the epidermis was found to form the roof and no corium structure intervened.

In the third variety small hæmorrhages were found in the dilated lymphatics, besides numerous lymphocytes. This is considered by some to be due to a wearing away of the sheath walls between the capillaries and the lymph varix.

Adjoining other lymph vesicles in the same section were widely dilated capillaries. Atrophied and degenerated sebaceous glands and hair follicles were present, but the sweat ducts remained unaffected.

Török, who has investigated this disease very thoroughly, lays great stress on the hyperplastic character of the new formation.

All investigators now regard this disease to be of lymphatic origin, except De Smet and Bock, who believe the vesicles are serous cysts derived from arterial capillaries of the papillæ. In the formol fixed sections it was an easy matter to distinguish the capillaries and blood-vessels, which were filled with stained red blood corpuscles from the dilated lymphatic vessels. There is no connection at this stage between the capillaries and the lymphatics.

We took cultures from a number of the vesicles, which were first completely sterilized on the surface, but the only results which were obtained was a pure culture of the staphylococcus albus (probably from the surface of the skin), in one case. Examination of the fresh contents of several of the vesicles did not reveal anything particular.

Various theories have been advanced in connection with the cause of this disease. Some think that new lymph vessels arise out of young connective tissue cells, whereas others think that contraction takes place in the neighborhood of the vessels, when young connective tissue is converted into connective tissue, whereby these lymphatics become dilated.

We are still following the course of this case and we expect to make a more minute microscopical examination of these

various vesicles, particularly as to their origin. For this purpose we have made three rings with the silver nitrate stick just along the anterior margin of the diseased patch, and we will thus be able to follow the first appearance of any fresh eruption.

In connection with the prognosis, the record of numerous previous cases mentioned by other observers shows that it is an exceedingly chronic disease and continues for many years, and that there is no certainty as to its getting permanently cured. The treatment which we have adopted, viz. internal tonics and externally the application of salicylic acid ointment (5 per cent), has improved the eruption so much that subjective symptoms are entirely absent and all inflammatory signs have disappeared. Cauterizing the vesicles has been recommended, and also the application of electricity, but not with very successful results.

II.—A Case of Urticaria Pigmentosa.

This next case, a child of 17 months, presents a very typical and pronounced example of a very rare disease of the skin, viz. urticaria pigmentosa. As far as the family history is concerned, both father and mother, who are living, are in good health and there is no history of any cutaneous affection in either parent. The mother has two other children. On one of these (the one next to the patient) similar nodules appeared, so the mother says, when the child was twelve months old, but they disappeared in a few months, never to return.

With reference to the history of the present eruption on this patient, the mother, and also some neighbors who were in the room at the time, noticed that the child just after birth presented a "very red appearance all over." This disappeared shortly afterwards. The present lesions, which you can see very distinctly, came out all at once when the child was only two months old. The mother describes the first appearance of the eruption as similar to that of measles, but it was accompanied by severe itching from the beginning. This symptom was so pronounced at times that it was thought the child would "go into spasms." About eight weeks after the first appearance of the eruption "blisters" began to appear. The duration, then, of the disease is fifteen months, and the distribution is universal. We notice that not only the whole scalp and face, including the eyelids, are affected, but the eruption is even profuse on both palms of the hands and both soles of the feet; a few lesions are also to be seen on the penis and scrotum.

The distribution of the skin lesions is so extensive over the whole body that only small portions of the normal skin are to be seen here and there over the trunk and extremities.

The lesions themselves present such varying characteristics that we recognise four varieties which are only different stages of the same disease.

The first variety consist of flat, discrete and confluent, variously sized—pin-head to split-pea sized—yellowish white or fawn colored patches or plaques, the majority of which can just be felt. They are exceedingly numerous and are scattered over the whole body, but they constitute almost entirely the eruption to be seen on the face. On picking them up

between the fingers they are soft, but one can still detect a slight thickening.

Those on the eyelids present almost the typical appearance of xanthelasma patches which are so often seen in this region.

The second variety consist of nodules, raised very abruptly from the skin. These also are distributed all over the body, but are particularly numerous over the trunk and extremities. They vary in color from yellowish white to fawn color, and on picking them up they are found to be fairly firm, but the older ones have a softer feel. They are rounded and smooth and vary in size from a pin-head to a split-pea.

The third variety consist of the excoriated nodules which the child has scratched. These also are numerous, especially on the trunk and extremities.

The fourth variety is the vesicular type, which is found particularly on the back. The vesicles vary in size from almost a pin-point to a large split-pea, and are situated either on the nodular forms or on the plaques. Some of the vesicles are clear, some have become pustular, and some have become hæmorrhagic. A few small telangiectic patches are to be seen scattered over the scalp.

The patches on the lower extremities had run together and now presented almost a violaceous appearance.

The lesions on the palms and soles consist of large pin-head to almost split-pea sized nodules which are distinctly flat, discrete and of a fawn color. A few of these lesions are also present on the palmar surface of the fingers. The eruption on the penis and scrotum consists of the flat nodular variety.

When we first saw the child we noticed that it was continually scratching itself, and as we have mentioned before, the "itching spells" would almost "throw the child into spasms." Since the child has been in the hospital we can, on any occasion, raise factitious wheals over the nodules and plaques, which thus swell up and become whitish; and on a few occasions similar wheals could be raised on the normal skin. The child has always been in fairly good health and has been gradually increasing in weight. He now looks well nourished and plump, but presents an anaemic appearance, and the tongue is clean.

So this case presents the following clinical features: a universal eruption occurring in a child 17 months old, which appeared all at once when the child was only two months old; consisting of plaques, nodules, vesicles and pustules, a number of which have appeared while the patient was in the hospital, accompanied by periods of intense itching and the presence of a factitious urticaria. All these characteristic features at once show that we have to do with a pronounced case of urticaria pigmentosa.

When the case first came under our notice it presented many of the features of xanthoma multiplex, especially the lesions on the face and eyelids, and Tilbury Fox's title of xanthelasmoidea would be particularly applicable to such a case as this. Since urticaria pigmentosa bears no relationship pathologically with xanthelasma, the term xanthelasmoidea has been discarded. To complete our diagnosis of this case we excised one of each variety of the lesions, when the child was put under the influence of ether.

We also excised small portions of wheals which were raised

artificially by drawing the finger-nail down sharply over a normal portion of skin. This was done in order to find the cause, if possible, of these lesions. A portion of normal skin was first removed, then a portion of a wheal raised on what appeared to be normal skin, four minutes after applying the finger-nail; another portion was removed after eight minutes, and a third one after twenty minutes. We noticed some time afterward that yellowish brown patches followed the formation of other wheals.

All the portions excised were dropped into a 5 per cent. formol solution, in which they remained twenty-four hours, after which the ordinary hardening process in alcohol was adopted. The plaques and nodules showed what appeared at first glance to be a new growth in the corium, and which had pressed so much on the epidermis as to cause the disappearance of the interpapillary projections (Fig. 2). The epidermis itself was unaltered except in the vesicular variety, where the whole epidermis had been raised up and thus formed the roof of the vesicle, and a few polynuclear leucocytes had wandered into the epidermal layer. The deepest layers of the rete contained a considerable amount of pigment. The whole corium, especially in the nodules, appears to consist almost entirely of endothelioid (?) cells (Fig. 2) situated in a fine connective tissue framework. In the plaques these cells are not quite so numerous, and in the still less developed patches they are seen to be grouped only round the vessels of the corium. These cells have been described by all recent investigators on the subject as "mastzellen" (Ehrlich). They are rich in protoplasm which stains well, and present also a well stained (where the hæmatoxylin and eosin stain have been used) large nucleus; their size is almost equal to that of an epithelial cell. Fig. 2 represents a section of a nodule from the arm. The whole corium is almost filled with large numbers of mastcells.

When the sections were overstained in Loeffleur's blue solution, the cells were found to consist of coarse granules, and the nucleus then could not be made out (Fig. 3). What appeared to be rather peculiar was the fact that karyokinetic figures were practically absent in any of these cells, and quite a number of them, especially in the nodules, were found to have undergone distinct fatty infiltration (Fig. 3, No. 4), so that in some the protoplasm had entirely disappeared. In some of the cells the granules had become very large, as if the smaller variety had combined together (Fig. 3, No. 3 and 7). These changes in the mastcells have not, as far as we at present know, been observed before. These "mastzellen" varied slightly in shape, but all of them showed the effects of pressure on one another, otherwise they were almost cubical or irregular in outline. In Fig. 3, A represents a magnified portion of Fig. 2 near the periphery. The mastcells are collected chiefly round the blood-vessels.

The older nodules did not present any inflammatory features, but the vesicular variety showed that the exudation had taken place chiefly between the epidermis and the corium. Polynuclear leucocytes were seen in large numbers throughout the whole corium and also collected just beneath the epidermis. One of the vesicles, which was excised very carefully, showed a hæmorrhage in the vesicle, but no hæmorrhages

were seen in any other variety which was examined. In this vesicular variety also the capillaries and smaller vessels running through this mass of cells were found to be filled with red blood corpuscles, numbers of which were also found outside of the vessels. As the result of fixing the excised portions of skin in formol solution, the red blood corpuscles were beautifully preserved and were stained a deep red with the eosin.

Sections from a nodule which was fixed in alcohol were stained according to Unna's method for "mastzellen," and the results showed that all these endothelioid cells were mastzellen; the nucleus was stained blue and the granules of the protoplasm red.

As the result of the examination of the normal skin, more "mastzellen" were found throughout the whole corium and subcutaneous tissue than one usually finds in normal skin, and they were scattered throughout the tissue besides being found near the vessels. The portion of the four-minute wheal which was excised showed a decided increase in number of the "mastzellen" arranged round the blood-vessels. We then felt very sceptical about this wheal having been produced on a normal portion of skin, but at the time of the excision we were very careful about this point, and the skin on which the wheal was produced appeared to us just the same as the portion of skin which we excised as a normal specimen. This decided increase in the number of these cells, especially round the vessels, within the space of four minutes was certainly extraordinary and appeared to be an impossible result. We feel so sceptical about this matter that we are anxious to renew this observation before we give these results as definite facts. The eight minute and the twenty minute sections also showed a further increase in the number of these cells. The sections were all excised under the same conditions and within the twenty minutes. It is hardly conceivable that such cells could come from the blood, or that they could proliferate so rapidly in four minutes.

The examination of factitious wheals at certain periods of time brings up the subject of the pathology of uncomplicated wheals which we have had the opportunity of investigating thoroughly in cases of urticaria factitia. In a paper which we read before the last meeting of the American Medical Association (Baltimore, 1895), we gave the results which we found after excising portions of wheals, raised artificially, after the lapse of two minutes, five minutes, eight minutes, fifteen minutes, twenty-five minutes, forty minutes and one hour. All these portions were excised with the full consent of the patient, who was a colored woman. This case was a particularly well marked example of urticaria factitia, and when wheals were raised artificially, an appearance of almost acute cellulitis was produced.

In reviewing the salient points which were obtained, we found, after the lapse of two minutes, dilatation of the capillaries of the papillæ, of the small vessels and particularly the veins of the upper corium; œdema of the same region; œdematous appearance of the connective tissue of the papillæ, and even of the papillary cells. Also the presence of one or two polynuclear leucocytes in the small veins.

After the lapse of *five minutes* the results were increased

dilatation of the vessels; increased numbers of polynuclear leucocytes inside the vessels, *the first sign of emigration of the polynuclear leucocytes* (only three or four were found just outside the vessel wall), the mononuclear round cells were increased in numbers in the section, and the lymphatic vessels were markedly dilated. After the lapse of *eight minutes* all the factors of the last stage were increased, especially in the larger number of polynuclear leucocytes which had emigrated from the vessels into the surrounding tissue. Two important results were found in these sections, *i. e.* the first appearance of disintegration of the polynuclear leucocytes and the undoubted increase in numbers of the mononuclear round cells.

After the lapse of *fifteen minutes* there was no doubt that we here had the typical picture of acute inflammation of the whole corium, viz. dilatation of the blood-vessels and lymphatics, œdema, formation of fibrin (in very small quantities), emigration of polynuclear leucocytes, disintegration of the polynuclear leucocytes, and increase in numbers of the mononuclear round cells. The epidermis remained unaltered. The later stages, *i. e.* after twenty-five, forty and sixty minutes, showed less and less inflammation, especially in the diminution of inflammatory œdema and the decrease in the number of the polynuclear leucocytes.

We were not able to see exactly similar results in the sections taken from the case of urticaria pigmentosa, because the wheals produced were not so pronounced; but there was emigration of leucocytes, a fact which is not admitted by Unna, and inflammatory œdema. It has thus been shown that the wheals produced artificially in urticaria are certainly inflammatory. Of course all wheals in u. factitia do not show such advanced stages of inflammation, as some will not proceed any further than the stage of acute hyperæmia and then disappear. In the spontaneous wheals which appear in other cases of urticaria, these also have been found to show all the factors constituting inflammation.

It has, we think, been also shown in these observations that the mononuclear cells are undoubtedly increased in numbers within the space of fifteen minutes. There were no evidences of karyokinesis, nor of budding of the cells; neither was there any evidence of the "wakening up" of cells as described by Grawitz, nor were there any dead cells found. We were driven to the conclusion that this increase in the mononuclear round cells was derived from the blood, and that they were lymphocytes. The one factor wanting to prove this result is to show that these cells contain no neutrophilic granules, and we are at present engaged in this task. These observations also have an important bearing in the fact that they demonstrate clearly what occurs in the earliest stages of inflammation in the human body, and they go to confirm the observations which have been made on animals. The next question which came to our minds was, how was this inflammation produced? The drawing down of the finger-nail over the skin did not injure it, as we have shown a number of times on other patients who were not suffering from urticaria, but only a transitory blush was produced. One of these latter cases was examined microscopically and nothing definite was found, the skin appearing quite normal.

A new theory, which was suggested to us by Dr. Welch

while examining our specimens, appears to explain satisfactorily the origin of the wheals of urticaria. He thought that there was a toxæmic condition of the blood in patients suffering from urticaria, and when the skin was stimulated, some of the toxine was set free into the tissues of the skin and thus set up inflammation. This view appears to us to explain all the phenomena of urticaria in all its forms, except, of course, urticaria pigmentosa and urticaria necrotica. Unna believes that in urticaria pigmentosa we have a primary persistent trophic disturbance of the skin which is of a progressive nature.

With reference to the prognosis of this case of urticaria pigmentosa, the child will get better of this affection when it arrives at adult age. For treatment we tried, at Dr. Osler's suggestion, the use of thyroid extract for two or three weeks, but no particular benefit resulted, and the child began to lose flesh. Large doses of tincture of belladonna are recommended by Crocker. As the result of living in the hospital and the treatment with tonics, viz. syr. ferri iodid. and cod liver oil, the child has improved very much in health, and the cutaneous lesions have all paled down very considerably. During the last week or two no fresh lesions have appeared. On two occasions when there was acute exacerbation of the urticaria, Rochelle salts were used with good results.

DISCUSSION.

Dr. FLEXNER.—It must, I think, be admitted that Dr. Gilchrist has brought forward strong evidence to prove that the mononuclear leucocytes are capable of leaving the blood-vessels quickly and in considerable numbers in certain skin affections. Pathologists have come more and more to regard the view that the polymorpho-nuclear cells alone leave the vessels in inflammation as insufficient. They have, however, regarded them as the earliest cells to escape in numbers. The observations reported this evening by Dr. Gilchrist, and to which he has referred at previous meetings, if confirmed, will necessitate a modification of the prevailing views on this subject.

In 1893 Unna[*] attempted to show the existence of a relation between the agent which brings about an inflammation in the skin and the composition of the inflammatory exudate. Thus he speaks of a pure leucocytic (impetigo pustule), a leucoserositic (eczema vesicle), a pure serositic and finally a leucofibrinocitic inflammation, and correspondingly conceives the attracting forces as leucotactic, leuco-serotactic, etc. In all these cases the primary cause is the invasion of micro-organisms below the horny layer of the epidermis, the immediate cause being the action of the toxins produced by the bacteria upon the blood-vessels of the papillary layer, and not the organisms themselves. The chemotactic action of the toxins is exerted, according to their nature, at one time upon the cells alone, at another upon the plasma alone, at still others upon these together. Moreover, in one case little of the fibrinogenous constituents will be drawn from the vessels, at another more. I speak of this as an interesting hypothesis only; but the differences observed in the cells found in the

* Entzündung und Chemotaxis, Berliner klin. Wochenschrift, Band 30, p. 471.

early stages of ordinary experimental inflammations and in those at times so quickly produced in the skin (urticarial wheals) open up a suggestive field of speculation and experiment.

Dr. GILCHRIST.—I investigated one case of dermatitis her-petiformis, and in connection with that disease demonstrated that the emigration of eosinophiles occurred in very large numbers. Quite recently some French observers have been working up the pathology of this disease, and have found eosinophiles in the exudates.

PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS HOSPITAL MEDICAL SOCIETY.

Meeting of January 20, 1896.

Dr. FLEXNER in the chair.

A Clinical and Experimental Study of the so-called Oyster-shucker's Keratitis.—Dr. RANDOLPH. See BULLETIN, Nos. 56–57.

Dr. KELLY.—It is pleasing to have this important local Maryland disease investigated by a man so closely connected with our work here as is Dr. Randolph. One thing particularly related to the spread of this form of keratitis is the manual act by which the piece of shell is thrown into the eye. There are two ways of opening an oyster: one, now going out of date, which is much more apt to produce the form of injury described; and another, which is coming more and more into vogue. By the old way the oyster is cracked on the edge with the heavy metal handle of the knife and then prised open with the blade. By the new way the man simply uses an instrument with a wooden handle and a well tempered knife-blade. He holds the oyster, presses in the tip of the blade between the shells, turns it a little, cuts the adductor muscle and so opens it. In the shucking-houses I visited at Cambridge with Dr. Goldsborough they opened the oysters by this latter stabbing method. As the older hammering method goes out of use this disease will be more and more rarely seen.

Dr. RANDOLPH.—The injury always occurs when the hammering method is used. In the New England States and elsewhere the hammer is not used. When the knife comes permanently on the scene the disease will probably disappear.

Experimental Lesions produced by the Action of Ricin on the Cortical Nerve Cell.—Dr. BERKLEY.

Six animals, rabbits and guinea-pigs, received injections varying from .125 to 1 mlg. ricin, subcutaneously or by intravenous injection. The animals died in from 14 to 72 hours, according to the amount of poison and manner of injection.

The cerebra were fixed in Müller's fluid, and afterwards the cortex of the encephalon was studied by the silver phospho-molybdate method and various nuclear stains.

In the finer vessels of the brain there were found swelling of the endothelial nuclei and some fragmentation. The perivascular channels contained considerable quantities of granular detritus, which in places was in sufficient amount to retard the lymph currents. Peculiar alterations of the nuclei of the nerve cells were seen with nuclear stains, showing a commencing breaking up of the cell.

Changes in the protoplasm of the nerve cells, especially in the finest extensions, were readily demonstrated by the silver phospho-molybdate method and extended over wide areas. The form taken by this parenchymatous alteration lay in a swelling of irregular character of the protoplasm of the dendrites, accompanied by more or less stripping off of the lateral buds or gemmulæ, according to the severity of the damage to the dendrite. These alterations proceed to the extent of entire destruction of the dendrons down to the cellular body, which last portion of the neuron eventually loses its angular contours and appears swollen and rounded. Quite as severe alterations may be produced by the intravenous injection of ricin in 14 hours as are produced by the same dose administered subcutaneously in 37 hours.

Changes in the axons were not demonstrated, nor are the collaterals and their bulbous endings damaged by the poison.

The bodies of the neuroglia cells of the cortex were found to be much larger than in the control slides, and were swollen, even globular in outline. Their extensions were also thicker and more nodular than is customary, but the cells show no augmentation in their numbers.

The conclusions arrived at were that the poison ricin, whose action is in many ways similar to that of many toxalbumens of bacterial source, is capable of exerting a deep and extensive degenerative influence on the protoplasm of the nerve cells of the brain; and its influence is explained (1) by its direct action on the protoplasm of the cell, and (2) by the disturbance of the nutrient blood supply, by reason of the changes in the walls of the arteries. The drug affords a most excellent means of studying degenerations of the brain cells, as its effect is uniform, and can be controlled both by the amount and duration of the poisoning.

Dr. FLEXNER.—The studies of Dr. Berkley upon the lesions of the cortical nerve cells produced by toxic substances, of which he has brought examples before us to-night in his study of ricin intoxication, are it seems to me very welcome additions to our knowledge of the lesions caused by this interesting group of substances. When I presented to this Society more than two years ago a brief preliminary account of the lesions in certain viscera (liver, kidneys, lymphatic glands, spleen, heart, etc.) which I was able to produce with surprising constancy by the inoculation of certain toxalbumens—for example, the poisonous products of the pneumococcus and the diphtheria bacillus, as well as the toxins derived from the higher plants (ricin, abrin) and those contained in animal fluids (blood-serum of the dog and human being.—I felt that the study of the central nervous system of these cases might reveal interesting changes. I was pleased therefore to have

Dr. Berkley act upon my suggestion to study these cases, and I was enabled to supply him with material representing very acute and more chronic forms of intoxication. The results of his first study of the brains of rabbits which had been poisoned by repeated injections of dog's serum left some doubt in my mind as to the part played by emaciation in causing the lesions, in view of Monti's observations upon the effect of starvation upon the nerve cell. Some of the rabbits which have been treated repeatedly with intravenous injections of dog's serum become greatly emaciated before death. It was desirable also, I thought, to exclude entirely the factor of thrombosis again because Monti found that blood emboli stopping the small cerebral vessels produced great changes in the nerve cell.

The confirmation and extension by Dr. Berkley of his previous observations based upon the study of the brains of rabbits and guinea-pigs poisoned by ricin eliminate completely the question of emaciation as a factor, for these animals died as early as 12 hours after the inoculation, and commonly in 36 or 48 hours, so that the loss in weight was, if at all present, inconsiderable. That the intravenous inoculation of solutions of ricin and abrin produces capillary thrombosis was pointed out by Stillmark, Hellin and Ehrlich and observed by me. I failed, however, to find similar thrombi in the general vessels (they are present in the local seat) after a subcutaneous inoculation, and Dr. Berkley has found the lesions described by him in the brains of guinea-pigs which have succumbed to such subcutaneous inoculations.

Dr. BERKLEY.—I think I mentioned in my paper that the lesions found in starvation were of a somewhat different order from those in the ricin or other irritant poison. They consist really of an atrophic condition. Monti systematically starved his rabbits for 8 to 10 days. He found this atrophy of the nerve elements very pronounced in all of them. Monti's stains unfortunately do not show these lateral buds.

Regarding the effects of thrombi, there were in our cases very few vessels in which there were actual thromboses. The only form that did occur was the plugs of red blood corpuscles. I discarded the idea that a lesion of this sort could be produced by thrombosis, for Monti's work on thrombosis produced a very different kind of lesion. There was a temporary swelling of the whole of the dendron or of the nerve body itself. This seemed to last only a short number of hours, and then a very rapid disintegration of the entire cell followed. I do not think the subject of thrombosis is of very great importance in connection with ricin poisoning so far as the brain elements are concerned.

Cardiac Hypertrophy.—Dr. BLUMER.

Dr. PARSONS.—The case from which the specimens were obtained was that of a boy of some eighteen years of age. His history was fairly good with the exception of rheumatism at six and again at eight, with a definite history of some trouble with the heart during the first attack. He first appeared in the dispensary in 1889. At that time he had evident heart disease. There was a very wide area of cardiac impulse, marked systolic retraction, a systolic murmur at the apex, and a presystolic murmur with a very definite thrill. He was admitted to the hospital on three occasions, his last stay being from September, 1894, until March, 1895. He was again admitted on Friday last in a very distressing condition: much cyanosed and very œdematous with marked ascites. It was very striking to see the way in which he throbbed from head to foot, and through his clothes could be seen a very distinct pulsation and throbbing in the hepatic area. On palpation a very distinct pulsation was felt in the hepatic region, also over the entire front of the chest. He was admitted to the ward about midday, and a note made at that time was to the effect that his general condition wss very bad, cyanosis was marked, he was very short of breath and his pulse was hardly countable. The most striking point about the case was the area of cardiac dulness; it extended from several centimeters to the right of the sternum completely around to the left, hardly any pulmonary resonance could be obtained in the left back until reaching the angle of the scapula. The boy died after being in the hospital about 2½ hours.

Dr. BLUMER.—The autopsy was made some six hours after death. There was nothing extraordinary in the external aspect of the body except very marked œdema of the lower extremities, with a purpuric eruption over the dorsum of the feet and to a less extent over the lower extremities. The abdomen was very much swollen and contained several thousand cubic centimeters of fluid. The chief points of interest were connected with the heart and liver. The heart was of tremendous size, occupying almost the whole of the left side of the chest, and compressing the left lung so that it was entirely airless in the lower two-thirds. The apex of the left lung contained a small amount of air. The lower lobe of the right lung was compressed to a much less extent. The heart extended perhaps eight centimeters to the right of the median line. There were dense fibrous adhesions between the anterior layer of the pericardium and the sternum, so that the heart was bound firmly to the sternum in front. Laterally there were also adhesions between both lungs and the pericardium, the adhesions on the left side not being so dense as those on the right. Below, the heart was densely adherent to the diaphragm. The liver was also densely adherent to the diaphragm, so that the heart and liver were practically in one piece. The pericardial sac was entirely obliterated, although in places the pericardium could be separated from the epicardium. The valves of the heart all showed more or less evidence of disease except the pulmonary semilunar valve. The tricuspid valve showed some shortening of the cusps and some thickening, and was more or less insufficient to the hydrostatic test. The cusps of the aortic valve also showed a certain amount of shortening and thickening. The mitral valve showed the most important changes. The aortic segment was slightly shortened, but it was fairly movable. The other segment of the valve was much more markedly shortened. The chordæ tendineæ were also shortened and thickened, so that this segment was held tightly against the ventricular wall. All along the auricular surfaces of the mitral valve there were numerous firm vegetations, as a rule about the size of a pin's head; they were all old and dense, and could not be scraped off, and there was no evidence of a fresh endocarditis. The heart muscle was greatly hypertrophied, and

the cavities of the heart were tremendously dilated, more especially those of the right side. The right auricle especially was dilated. The inferior vena cava could not be made out above the diaphragm; that is to say, the dilatation was so great that the vena cava and right auricle were one cavity. The hepatic veins were so enormously dilated that the index finger could be passed from the right auricle directly into the liver some 6 or 7 cm. The dilatation of the left side of the heart was not so marked, but was quite extensive. The liver, beyond the tremendous dilatation of the hepatic and sublobular veins, showed other interesting conditions. The capsule was greatly thickened in an irregular way. In places the thickening was in the form of very dense fibrous tissue. The liver showed a marked cirrhosis of two varieties—a mixed cirrhosis. Immediately underlying the areas of dense connective tissue in the capsule were areas of what one might almost call consolidation of the liver substance. There had evidently been an extension of the inflammation from the capsule down into the liver substance at these points, and in places fibrous tissue was in such amount that on section the liver actually cupped like the cupping one sees in the more schirrous forms of carcinoma where the fibrous tissue is in excess. This condition would come under the head of Glissonian cirrhosis. Besides this there was a central cirrhosis beginning around the sublobular veins and extending outward from these in the form of dense bands of fibrous tissue. The signs of chronic passive congestion were also present. The capsule of the spleen likewise showed a moderate degree of thickening.

The case is interesting because of the large size of the heart and the changes in the liver. The size of the heart could hardly be accounted for by the valvular lesions alone, but was probably in large measure due to the dense adhesions of the organ to the surrounding structures. Of course every time the heart would beat it had not only to overcome the valvular insufficiency, but had to pull directly upon the sternum, the liver and both lungs, so that the amount of work which it had to perform was enormously increased. The large size of the hepatic veins and their consequent direct communication with the right auricle would of course explain the pulsation of the liver which was so very marked during life.

Exhibition of Surgical Cases.—Dr. PLATT.

1. A NEW METHOD OF TREATMENT OF PROLAPSUS ANI.

This method of treatment is not at all original with me. I had operated on a child in vain by other methods. I had twice employed linear cauterization, thus endeavoring to bring about adhesion between the bowel and the tissues without, but without avail. Dr. Earle of Baltimore recommended an operation which Dr. Kelly had suggested, and which completely cured the prolapse. Not long ago this second patient entered the Garrett Hospital with an obstinate prolapse of the rectum, which projected about four inches below the body each time the child had a stool. I did this operation, keeping the suture in for three weeks. It was entirely successful. I afterward learned that Dr. Kelly has used this operation in the vagina in cases of prolapse of the uterus. In the case of

the anus it is performed in this way: At the junction of the skin and mucous membrane, just beneath the latter, a curved needle is inserted in the median line below, and a silk thread is carried half way around the anus and out again, in the median line above, re-inserted in the same opening and brought out at the first puncture, making a purse-string suture. The little finger is then put in the anus and the string tied snugly around it. Apparently this would cause suppuration, and possibly a fistula. It does nothing of the kind, nor does it cause any pain afterward. The child has his stools in the recumbent position. If the feces are at all hard, injections are given to soften them. After three weeks the suture is withdrawn and the place kept clean, when it heals immediately with no return of the prolapsus. By this method the bowel is kept in place long enough to contract adhesions; by the other methods it is difficult to keep the bowel from coming down after or during a stool: no pad in the world will keep it up in the case of a young child. Two weeks after removal of the sutures in these two cases one could not tell that sutures had been used.

2. ACQUIRED CLUB FOOT.

This girl of 8 has never been operated on. At the age of about three years she had a slight fever, which the mother thought was due to her teeth; immediately afterward she could not walk. This, of course, was poliomyelitis. The child after a time began to walk after a fashion, and braces were put on. The braces were of very little value. The right foot is a case of talipes valgus. The ligaments are extremely weak, and it is more difficult to know what to do with this foot than with the other. The only surgical operation is to produce an ankylosis. The left foot is evidently an acquired club foot, and much can be done for it. It now resembles a congenital club foot, being strong and resistant. You can bring it partially into shape, but it resumes its former shape as soon as strong force is removed. I hope to do an osteotomy on this foot which may correct it entirely.

3. CONGENITAL CLUB FOOT.

This is a gentleman 24 years of age, upon whom I operated four or five years ago for club foot. He had been operated upon twice before by other surgeons, with no improvement. It is only fair to say that these cases are very difficult to keep under observation, and it requires incessant care to get good results. Hospital cases should be done quite radically because they are very apt to tire of treatment, and the case comes to nothing. The patient was nearly twenty years of age when I operated. The operation was done on his left foot. No tarsal bones were excised. I could probably have gotten even a better result had I done so. After cutting the contracted tendons and plantar fascia I over-rectified the foot by means of great force applied with a lever previously used, and then put it up in plaster. In three months he could walk very well. He wore a brace for a short time, but now he wears a brace only when he expects to use the foot excessively. In these operations the main object is to get a foot with which the person can walk well. This patient can walk and stand on the sole of his foot without a brace.

4. Congenital Club Foot.

This little boy, æt. 7 years, had a bad case. I divided the contracted tendons, put him up in plaster, and then in an apparatus. Later it was evident that something more must be done. Dr. Parsons excised one astragulus and I excised the other two months later. He was put up in plaster for ten days. Since then he has never worn any apparatus. The result is excellent, as you see.

CORRESPONDENCE.

A Case of Hemiplegia occurring with Typhoid Fever.

To the Editor of the Bulletin.

Dear Sir :—In addition to the four cases of this exceedingly rare complication of typhoid fever reported in the April number of the Bulletin, I can add the history of the following case which presented itself at the clinic of Prof. John C. Shaw, Neurologist to the Brooklyn Eye and Ear Hospital.

F. L., thirty years of age, single, born in the United States, and a railroad switchman by occupation. His family history is unimportant and he had no illness excepting a gonorrhœa, till October, 1895, when he had an attack of typhoid fever, lasting twenty-one days, during the course of which his temperature rose as high as 105° F., attended by delirium. On the fourteenth day his mother, who was nursing him, noticed that he did not move his left arm and leg as much as or as well as the other and that they felt dead and cold. When he began to get up he could not stand, on account of the weakness (he termed it) of his left leg. Both upper and lower extremities felt numb. Face and speech not at all affected. No loss of sensation. Nearly entire loss of motion of upper extremity, but not so profound of lower. He remained in this condition for a couple of months, when improvement began—first noticeable in the leg, which became strong enough finally for him to stand upon and then to walk.

At present he is a man of short stature, weighing 133 pounds. Face and speech show no lesion. Left upper extremity shows marked atrophy, with half the power and motility of the right ; can use it to help dress himself but not to carry anything. When he tries to raise up the elbow suffers pain running down the outside of the arm from the shoulder and the elbow. No loss of sensation or of heat or cold. No dragging of left lower extremity, which is only slightly atrophied, with no loss of motion or sensation ; only he says it gives out quicker than the other. Tendon reflex at knee more marked than on right limb. General health is good. Heart and urine normal. Electrical contractility of upper extremity diminished.

This case differs from the others reported in occurring in the left side instead of the right (he is a right-handed man), and there were no convulsions, aphasia or facial paralysis, but agrees with their subsequent history of slow repair.

W. H. Haynes, M. D., *Brooklyn, N. Y.*

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BULLETIN

OF

THE JOHNS HOPKINS HOSPITAL.

CONTENTS.

THE WITCHES' PHARMACOPŒIA.*

By ROBERT FLETCHER, M. D.

The subject of this evening's paper is extraordinarily copious, and long-descended in its history. A belief in witchcraft characterized the earliest periods of which we have any record; it prevails among all savages or semi-civilized peoples at the present time, and is by no means extinct in otherwise intelligent communities. The cowardly fear and the resulting cruelties which have sprung from this strange superstition are too well known to need comment. In Merry England and in religious New England, men and women, old and young, the ministers of the Gospel, the clown and the philosopher, have perished at the stake or on the gallows, victims to this hideous delusion. A striking feature in the history of witchcraft is the fact that by far the greater number of its votaries were women, mostly old women. It is hard to find any explanation of this condition. King James I., in his Demonologia, ungallantly accounts for it by saying: "For as that sex is frailer than man is, so is it easier to be entrapped in these grosse snares of the Divell, as was over well proved to be true by the serpent's deceiving Eve in the beginning, which makes him the homlier with that sexe sensine."

The personal appearance of the typical witch was not attractive. Harsnet, in a work published in 1603, says a witch is "an old weather-beaten crone, having her chin and knees meeting for age, walking like a bow, leaning on a staff, hollow-eyed, untoothed, furrowed, having her limbs trembling with palsy, going mumbling in the streets; one that hath forgotten her paternoster, yet hath a shrewd tongue to call a drab a drab." (Declaration of Popish Imposture, 136.)

If she ventured out in the daylight she was pursued with obloquy. In Gay's fable of The Old Woman and her Cats, the poor creature exclaims:

> Crowds of boys
> Worry me with eternal noise;
> Straws laid across my path retard
> The horse-shoe's nailed (the threshold's guard).
> The stunted broom the wenches hide,
> For fear that I should up and ride.
> They stick with pins my bleeding seat,
> And bid me show my secret teat.

Your genuine witch was believed to be incapable of shedding tears, and if through torture she could be made to weep, her power had departed and she became a helpless victim to justice. King James says: "They cannot even shed tears, though women in general are like the crocodile, ready to weep upon every light occasion."

Old age was not always a necessary adjunct to witchcraft. Some of the famous witches of classical times, such as Cœlilia, Eriethoe, and Circe, were beautiful women. The first was a famous hetaira and was one the mistress of Horace.

Accounts are given in history and legend of wizards who practised their diabolical art, but they seem to have labored for more important purposes than their female rivals. In old

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chronicles, in popular story, and above all in the drama, it is the witch who figures as the minister of evil, and it is with her and her marvelous storehouse of materials we have to do to-night.

It is a mistake to suppose that these materials consisted only of offensive or grotesque substances—of " eye of newt and toe of frog." If the time permitted it would not be difficult to show that certain legendary qualities attached to them have come down from classic and pre-classic days. This will to some extent appear as we progress in the enquiry, for the literature of witchcraft is very ancient, and it will be found that the same ingredients have been made use of through many ages to produce the like results. Astrology lent its aid, and plants which were under certain planetary influence, especially those belonging to the moon, acquired more potency in consequence. Old Culpepper, in his British Herbal, gives a list of over 500 plants with the planets which govern them. The doctrine of signatures too had its influence in the selection of ingredients for malevolent as well as for healing purposes, and if liver-wort or eye-bright were powerful for good, the lurid flowers and leaves of aconite, hemlock, henbane, and belladonna were manifestly suited for diabolic charms.

The term pharmacopœia made use of in the title of this paper, must be understood in its most comprehensive sense. It comprises substances from the vegetable and animal kingdoms, and the products of the atmosphere must be included.

In addition to its materia medica, witchcraft has its especial pharmacology. Not only must the materials be procured with certain magical forms and precautions, many of which are of Druidical origin, but the commixture must be made under spell and incantation. There are two divisions of the pharmacopœia of witches, of distinctly opposite qualities—one, and the most numerous, comprising noxious ingredients, and the other consisting of the ordinary healing remedies of popular medicine. The woman who made use of the latter was known as a " white witch." She removed warts, cured fits, counteracted the spells laid upon cattle, and was looked upon as a generally beneficent sort of neighbor. The grey witch was one who, as occasion required, practised either the kindly or the malevolent arts, and the black witch was one who dealt in the latter exclusively. A mere list of the materials employed by the malevolent witch would be wearisome, and it will be more interesting and convenient to select from the rich stores of the drama and of poetry some passages which refer to witches and their baleful arts. Some comments elucidatory of the qualities and the folklore history of the ingredients employed, will, I trust, be not uninteresting.

The play most familiar to us all in which witches play a tragic part is, of course, Macbeth. Thomas Middleton, a contemporary of Shakespeare, was the author of a drama called The Witch which is wonderfully rich in this particular lore. A comedy by Thomas Heywood, entitled The Late Lancashire Witches, was published in 1634. Another comedy entitled The Lancashire Witches, and Teague O'Divelly the Irish Priest, written by Thomas Shadwell, was first performed at the Duke's Theatre in 1682. The two latter plays were reprinted in 1853 by Mr. James Orchard-Halliwell, the celebrated Shakespearean scholar, only 80 copies being printed. This work is now extremely scarce. From these plays and from collateral writings my illustrations will be drawn.

It is proper to say that in neither of these dramas has the author devised the proceedings he describes from his own imagination, so far as the materials and methods employed are concerned. These have been borrowed largely, and in some instances literally, from Reginald Scot's Discoverie of Witchcraft, published in 1584. He, in his turn, had delved with wonderful diligence in fields of all kinds from classic days to his own, and this confirms what I have already stated as to the great antiquity of the folklore of witchcraft.

The famous incantation scene when the witches are expecting the approach of Macbeth, and have filled their cauldron with the most powerful ingredients of their art, is curious as exhibiting almost exclusively substances of animal origin. The only exceptions are " root of hemlock digg'd i' the dark," and " slips of yew silver'd in the moon's eclipse." Familiar as it is, it must be repeated in full for the sake of some comments upon the composition of the " hell-broth."

First Witch. Round about the caldron go ;
In the poison'd entrails throw,—
Toad, that under the cold stone
Days and nights hast thirty-one
Swelter'd venom sleeping got,
Boil thou first i' the charmed pot.
All. Double, double toil and trouble ;
Fire burn, and, caldron, bubble.
Second Witch. Fillet of a fenny snake,
In the caldron boil and bake ;
Eye of newt, and toe of frog,
Wool of bat, and tongue of dog,
Adder's fork, and blind-worm's sting,
Lizard's leg, and howlet's wing,—
For a charm of powerful trouble,
Like a hell-broth boil and bubble.
All. Double, double toil and trouble ;
Fire burn, and, caldron, bubble.
Third Witch. Scale of dragon ; tooth of wolf ;
Witches' mummy ; maw and gulf
Of the ravin'd salt-sea shark ;
Root of hemlock digg'd i' the dark ;
Liver of blaspheming Jew ;
Gall of goat ; and slips of yew
Silver'd in the moon's eclipse ;
Nose of Turk, and Tartar's lips ;
Finger of birth-strangled babe
Ditch-deliver'd by a drab—
Make the gruel thick and slab ;
Add thereto a tiger's chaudron,
For the ingredients of our caldron.
All. Double, double toil and trouble ;
Fire burn, and, caldron, bubble.
Sec. Witch. Cool it with a baboon's blood,
Then the charm is firm and good.

The commentators have expressed some conjectures as to what the " poisoned entrails " were, but there is, I think, no doubt that the term applied to the entire ingredients of the cauldron. The toad figures constantly in necromantic charms, and its venom, if it have any, is supposed to reside in the glands of the skin. The blind-worm is the slow-worm, which is spoken of in Timon as the " eyeless venom'd worm." As a matter of fact it is a harmless reptile. Mummy was formerly

one of the articles of the pharmacopœias, and its virtue was doubtless due to the aromatics with which it was endued. Sir Thomas Browne, in his Urn-burial, says of it: "The Egyptian mummies which Cambyses or time hath spared, avarice now consumeth. Mummie is become merchandise. Mizraim cures wounds, and Pharaoh is sold for balsams." The "gulf of the ravin'd salt-sea shark" is the stomach of that voracious fish. "Nose of Turk and Tartar's lips" seem to have no obvious qualifications, but it would be hard to find two lines of as concentrated expression as those which follow—

> Finger of birth-strangled babe
> Ditch-delivered by a drab.

The "tiger's chaudron" means the entrails of the animal. The tiger is of great importance in Chinese medicine; for an attack of hydrophobia the skull, teeth and toes of the animal are ground up and given in wine.

This wonderful collection of "poisoned entrails" was to be cooled with a baboon's blood. The baboon, or *babian* of the Dutch, was a large and dangerous ape, described by travelers of those times as found in great flocks near the Cape of Good Hope. Monstrous stories were told of it by contemporary writers.

When in reply to Macbeth's demand for further prognostications of his fate, more charms became needful, the first witch says:

> Pour in sow's blood, that hath eaten
> Her nine farrow ; grease that's sweaten
> From the murderer's gibbet throw
> Into the flame.

In illustration of the first of these ingredients, Stevens quotes from Holinshed's History of Scotland, 1577, a law of Kenneth II. which provided that, "if a sowe eate her pigges let her be stoned to death and buried."

The fat or grease that drops from the body of the murderer hung in chains was one of the ingredients in the preparation of the "hand of glory," and it was also believed that where it fell the baleful mandrake sprang. Human fat was long believed to be a remedy for rheumatism and sprains. A German druggist once told me that it is still asked for, but that harmless goose-grease stiffened with spermaceti is the succedaneum, and when served from an antique jar with a mysterious inscription upon it, it gives great satisfaction.

Another and very important use of human fat was to anoint the body of a witch and thus enable her to soar through the air. This will be spoken of in more detail further on. In Middleton's play of The Witch, Hecate says to one of her followers:

> There, take this unbaptised brat ;
> *Giving the dead body of a child.*
> Boil it well ; preserve the fat ;
> You know 'tis precious to transfer
> Our 'nointed flesh into the air,
> In moonlight nights.

This play of Middleton's was discovered in manuscript in the last century. It contains incantation scenes very similar to those in Macbeth, and it has been a matter of debate with the commentators whether Shakespeare copied his witch scenes from Middleton, or Middleton copied from Shakespeare.

There is no question of the superiority of the latter in the strength and sublimity of the passages, but it may become necessary for the followers of Mr. Ignatius Donnelly to insist that Lord Bacon also wrote Middleton's plays.

In The Witch, Hecate recounts the materials of her charms, which belong to the vegetable materia medica. Stadlin, her acolyte, says:

> Where be the magical herbs?
> *Hecate.* They're down his throat ;
> His mouth cramm'd full, his ears and nostrils stuff'd ;
> I thrust in eleoselinum lately,
> Aconitum, frondes populeas, and soot—
> You may see that, he looks so black i' the mouth—
> Then sium, acorum vulgare too,
> Pentaphyllon, the blood of a flitter-mouse,
> Solanum somnificum et oleum.

These magical ingredients were crammed into the mouth and nostrils of the unbaptised babe before boiling him for his fat. The entire formula is taken almost literally from Reginald Scot's Discoverie of Witchcraft, and he obtained it from one of the curious works of John Baptista Porta, the Neapolitan, who wrote about everything that savored of superstition.

In the foregoing passage eleoselinum is the Apium petroselinum, or parsley. Sium is the winter-parsnip ; acorum is calamus, which in the doctrine of signatures belongs to the stomach. Pentaphyllon is the Greek name for the cinquefoil, or Potentilla reptans, its five leaves representing the five senses. The flitter-mouse, or flicker-mouse, is the bat. The populeas frondes are the leaf-buds of the poplar, till lately used as an ointment. The poplar was also a funeral tree. In another scene of the same play Hecate asks of her son Firestone:

> Dear and sweet boy ! what herbs hast thou?
> *Firestone.* I have some marmartin and mandragon.
> *Hecate.* Marmaritin and mandragora, thou wouldst say.
> *Firestone.* Here's panax too, I thank thee—my pan action I a
> sure,
> With kneeling down to cut 'em.
> *Hecate.* And selago.
> Hedge-hyssop too ; how near he goes my cuttings !
> Are they all cropt by moonlight ?
> *Firestone.* Every blade of 'em.
> Or I'm a moon-calf, mother.
> *Hecate.* Hie thee home with 'em ;
> Look well to the house to-night ; I'm for aloft.

Selago was a plant of much renown. It was probably the Club-moss, or Lycopodium selago, and was held in great repute by the Druids, who termed it Golden herb, or Cloth of Gold. It had to be gathered by a naked maiden on a moonlight night under a cloudless sky. When she touched the plant with her foot it was taken up with many precautions, and it conferred on the possessor the power of understanding the language of birds and beasts. There is a curious old print representing the damsel touching the plant with her foot while two Druid priestesses watch the proceeding. They are standing underneath an oak tree, and one of them holds a branch of mistletoe in her hand. The print has been reproduced by Mr. Folkard in his Plant-Lore. The hedge-hyssop is the Gratiola.

There is much folklore connected with parsley. The Greeks bestowed a crown of dried parsley on the victor at the Isthmian games. They strewed it also on the bodies of the dead. A despairing lover cries:

> "Garlands that o'er thy door I hung,
>   Hang withered now and crumbling fast ;
> Whilst parsley on thy fair form flung,
>   Now tells my heart that all is past."

Its ominous association with death no doubt accounted for its presence in necromantic compounds. It was also an emblem of generation, and the belief survives in the nurse's story to the children that the newly arrived infant was dug out of the parsley-bed. Of the mandragon or mandrake much will have to be said presently.

To return to Middleton's play. In the fifth act a Duchess, " on fell thoughts intent," enters the abode of Hecate, and finds the queen of witches before a caldron. This dialogue ensues:

Hec. What death is't you desire for Almachildes?
Duch. A sudden and a subtle.
Hec. Then I've fitted you.
Here lie the gifts of both, sudden and subtle ;
His picture made in wax, and gently molten
By a blue fire kindled with dead men's eyes,
Will waste him by degrees.
Duc. In what time, prithee?
Hec. Perhaps in a moon's progress.
Duc. What, a month?
Out upon pictures, if they be so tedious !
Give me things with some life.
Hec. Then seek no farther.
Duc. This must be done with speed, dispatch'd this night,
If it may possible.
Hec. I have it for you :
Here's that will do't ; stay but perfection's time,
And that not five hours hence.

After further colloquy the Duchess leaves and Hecate proceeds to concoct her fatal mixture.

Hec. Give me some lizard's brain ; quickly, Firestone.
Where's grannam Stadlin, and all the rest o' th' sisters?
Fire. All at hand, forsooth.
                Enter Stadlin, Hoppo, and the witches.
Hec. Give me marmaritin, some bear-breech ; when?
Fire. Here's bear-breech and lizard's brain, forsooth.
Hec. Into the vessel ;
And fetch three ounces of the red-hair'd girl
I killed last midnight.
Fire. Whereabouts, sweet mother ?
Hec. Hip, hip or flank. Where's the acopus?
Fire. You shall have acopus, forsooth.
Hec. Stir, stir about, whilst I begin the charm.
Black spirits and white, red spirits and gray,
Mingle, mingle, mingle, you that mingle may !
Round, around, around about, about !
All ill come running in, all good keep out !
First Witch. Here's the blood of a bat.
Hec. Put in that, O, put in that !
Sec. Witch. Here's libbard's-bane.
Hec. Put in again !
First Witch. The juice of toad, the oil of adder.
Sec. Witch. Those will make the younker madder.
Hec. Put in—there's all—and rid the stench.
Fire. Nay, here's three ounces of the red-haired wench.
Chorus. Round, around, etc.

Of the ingredients made use of for this potion intended to be fatal to the Duchess's husband or lover, the bear-breech deserves some notice. It is the Acanthus mollis, much employed for decorative purposes by the Greeks and Romans. Its leaves form the principal adornment of the capital of the Corinthian pillar. The story of its origin is too well known to need repeating. The oil of adder is probably not a product of the snake, but is the " greene oyle " obtained by boiling the Adder's tongue, or Ophioglossum vulgatum, in olive oil. The herb was in great favor with witches. The libbard's-bane or leopard's bane, often called wolf's-bane, is the Aconite. In Ben Jonson's Masque of Queens is this verse:

> I ha' been plucking, plants among,
> Hemlock, henbane, adder's-tongue,
> Night-shade, moonwort, libbard's-bane.

It is suggested by the commentators that the poison which the Apothecary sold to Romeo was Aconite. The latter demanded a poison so swift with action—

> That the life-weary taker may fall dead,
> And that the trunk may be discharged of breath
> As violently as hasty powder fired
> Doth hurry from the fatal cannon's mouth.

This is possibly confirmed by a passage in the second part of Henry IV. :

> Though it do work as strong
> As Aconitum or rash gunpowder.

It is a classic legend that Aconite sprung originally from the foam dropped from the mouth of Cerberus, the triple-headed dog of hell. The hood-shaped flower from which its name of monks-hood was derived, was in Scandinavian folklore known as " Thor's hat." Ben Jonson in his play of Sejanus (Act III.) describes a homœopathic use of Aconite:

> I have heard that Aconite
> Being timely taken hath a healing might
> Against the scorpion's stroke ; the proofe we'll give
> That while two poisons wrastle, we may live.

Henbane, the Hyoscyamus, was another plant of ill omen. Plutarch tells us that it was woven into a chaplet for the dead. Juno's horses were fed upon it, according to Homer, and it still holds a place in the veterinary pharmacopœia as a remedy for certain equine disorders. It is supposed to be the " insane root " which Banquo speaks of :

> Have we eaten of the insane root
> That takes the reason prisoner ?

Old Bartholomæus says of it: " Henbane is called insana, mad, for the use thereof is perilous, for if it be eate or dronke, it breedeth madness, or slow lykenesse of death."

The yew-tree, from its sombre foliage and its constant presence in churchyards, had an evil repute. Shakespeare calls it " the double fatal yew," from the poisonous qualities of its leaves and from its wood being employed to furnish bows, the instruments of death. It was famous for the latter purpose. Browne writes of it as—

> The warlike yeugh, by which more than the lance
> The strong-armed English spirits conquered France.

It was much used by the witches in their charms. Hecate announces to the aërial spirit:

> With new fallen dew
> From churchyard yew
> I will but 'noint,
> And then I'll mount.

It has been thought that the "juice of cursed hebenon," which caused the death of Hamlet's father, was the juice of yew leaves. In Marlowe's Jew of Malta it is called "juice of hebon." Eben, hiben, were Norse names of the yew.

Hemlock, the Conium maculatum, is supposed to be the fatal poison administered to Socrates, Phocion and other Greeks condemned to death by the Areopagitica. It is a constant ingredient of the witches' charms.

The Deadly Nightshade, the Atropia belladonna, is a powerful poison also much used by witches. Those who partook of it were seized with madness, during which they prophesied and saw visions. Possibly the dilatation of the pupils, the well known effect of atropine, accounted for this latter belief. The Solanum dulcamara, the common nightshade, had poisonous berries, but the root and stems were employed in medicine, though their use is, I suppose, now obsolete.

Among the ingredients employed by Hecate there are two which the commentators have given up in despair of their identification, namely, acopus and marmaritin. Nevertheless, both of them are mentioned by Pliny in his Natural History. Acopus, or acopos, he describes as "a stone like nitre in appearance, porous and starred with drops of gold. Gently boiled with oil and applied as an unguent it relieves lassitude, if we choose to believe it," he discreetly adds. Marmaritis he says is the plant Aglaophotis, which owes its name to the admiration in which its beauteous tints are held by man. "It is found growing among the marble quarries of Arabia on the side of Persia, a circumstance which has given it the additional name of Marmaritis" (from *marmor,* marble). "By means of this plant," he continues, quoting from Democritus, "the Magi can summon the deities into their presence when they please." It is interesting to observe a bit of Magian lore coming from ancient Persia preserved in the charm of a witch in the 17th century. The plant has not been identified, though it has been with some reason supposed to be the Peony. This handsome flowering plant was held in great esteem by the ancient Greeks. Its name Pæonia was derived from Pæan, the first physician who attended upon the divinities upon Olympus. According to Homer he healed the wounds of Ares and Hades. The name Pæon was also applied to Apollo, and a pæan was a song which celebrated his healing power. Pæonia, or the healing goddess, was also one of the names of Minerva.

The unhappy old women who were suspected of being witches were subjected to many well known ordeals to make them confess their diabolic powers. Even in very recent times there are accounts of ignorant rustics tying the thumbs and toes of a supposed witch together and throwing her into a pond, where if she floated she was a witch, and if she sank, as was most likely, she usually died from the ill usage. It is gratifying to know that Matthew Hopkins, the notorious witch-finder, met his death in this manner at the hands of some country fellows who believed him to be a wizard. Hudibras refers to the miscreant's fate in these lines:

> "Who after proved himself a witch,
> And made a rod for his own breech."

Hopkins' method was to probe all parts of the woman's body with pins or needles until he found the "witch spot," which was insensible to pain. There is still to be seen in the courthouse of Salem, Massachusetts, a bottle of pins which had been used in this manner during the witch-hunting which led to the execution of twenty-two persons on Gallows-Hill in that city in 1692. In Shadwell's play of The Lancashire Witches, Sir Jeffery, a justice of the peace, says:

"Now, you Shocklehead, and you Clod, lay hold o' th' witch quickly. Now you shall see my skill; wee'l search her: I warrant she has biggs or teats a handful long about her parts that shall be nameless; then wee'l have her watched eight and forty hours, and prickt with needles, to keep her from sleeping, and make her confess; gad, shee'l confess anything in the world then; and if not, after all, wee'l tye her thumbs and great toes together and fling her into your great pond."

The "biggs or teats"—bigg is an old English name for a cow's teat—refer to a curious belief. Every witch was supposed to have in some unseen part of her body a teat with which she nourished her own particular imp or familiar. There is no reference to it in ancient writers; it seems to have been a happy discovery of the English witch-finders.

In a scene of the same play the witches are relating to their master the Devil, who is in the form of a black goat, their several achievements. Mother Demdike says:

> To a mother's bed I softly crept,
> And while the unchristen'd brat yet slept,
> I suckt the breath and a blood of that,
> And stole another's flesh and fat,
> Which I will boyle before it stink.

The use made of the fat of an unbaptised child has been already mentioned, but there is something to be said as to the sucking its breath. A cat, especially a black cat, was the familiar companion of the witch, and she was supposed to sometimes assume its form and suck a sleeping child's breath till she destroyed it. The common belief that a cat may perform this injurious act not improbably had its origin in the superstition that the creature was a witch in disguise.

Among the functions of witches, the preparation of philters, or love cups, which were to procure the affections of youth or maiden, played an important part. It must be said that the ingredients of these charms were obscenely nasty, and most of them may well be omitted from notice. In the same scene of the play just quoted, Mother Spencer says:

> To make up love-cups, I have sought,
> A wolf's tayle-hair and said I've got
> The green frog's bones, whose flesh was ta'en
> From thence by ants, then a cat's brains,
> The bunch of flesh from a jades back's bone,
> Just as his dam was brought to foal,
> Before she lickt it.

The bunch of flesh upon the new-born foal's head is the Hippomanes, concerning which some wondrous beliefs were held.

It was of black color, the size of a fig, and if it was removed artificially instead of being licked off by the mother-mare, she refused to allow the foal to suck. Virgil, Ovid, and other classical authors speak of it as a famous aphrodisiac and much employed in the preparation of love philters. Thus there is another instance of the antiquity of the witches' materials. Cuvier says that the hippomanes is a concretion sometimes found in the liquor amnii of the mare, and is eaten by her just as the placenta is eaten by many animals after parturition.

Further on, one of the persons of the play says: "Fennel is very good in your house against spirits and witches; and alicium, and the herb mullein, and longwort, and moly, too, is very good."

Fennel was given to the victors in the Isthmian games, and on account of its pleasant odor and graceful tendrils it is used even now as a decoration for the table. It was hung on doorways to keep away evil influence. Mullein, the Verbascum thapsus, from its woolly fibres was readily inflammable, and its stalks dipped in suet made a candle which was known as hig- or high-candle, and by corruption, hag-candle. The ancient Romans called the plant Candelaria, and used it as a torch at funerals. In Italy it is still called Light of the Lord.

Alicium has not been identified.

Longwort is the Pulmonaria or lungwort, sometimes known as the Jerusalem cowslip. From its spotted leaves it was, under the doctrine of signatures, held to be a remedy for diseased lungs.

Much has been written about the herb Moly, which is the last named in this passage. It was first mentioned by Homer as the remedy given by Hermes to Ulysses to enable the latter to withstand the enchantments of Circe. It has been thought to be a species of Allium or garlic. It is worth noting that most of the preservatives against evil influences were strong aromatics.

In the same scene Mother Demdike and her excellent sisters give us some further insight into their pharmacopœia:

Demd. Oyntment for flying here I have,
Of children's fat stoln from the grave,
The juice of smallage and nightshade,
Of poplar-leaves and aconite made;
With these
The aromatick reed I boyl,
With water-parsnip and cinquefoil,
With store of soot, and add to that
The reeking blood of many a bat.

Mother Dickinson. From the sea's slimy owse a weed
I fetched to open locks at need.
With coats tukt up, and with my hair
All flowing loosely in the air,
With naked feet I went among
The poisonous plants, there adders-tongue,
With aconite and martagon,
Henbane, hemlock, moon-wort too,
Wild fig-tree that o'er tombs do's grow,
The deadly nightshade, cyprus, yew,
And libbard's-bane, and venomous dew,
I gathered for my charms.

Mother Hargrave. And I
Dug up a mandrake, which did cry;
Three circles I made, and the wind was good,
And looking to the west I stood.

Most of these plants have already been commented upon. Smallage is our familiar celery, which has appropriately fallen from a witch's ingredient into a preposterous quack remedy of the present day. What kind of weed it was "from the sea's slimy owse" which would open locks, I cannot tell. It was a part of the ceremonial to go with naked feet and hair unbound when gathering magic herbs.

The Martagon is the Moonwort, the Botrychium lunaria. If placed in a key-hole it had the power of opening the lock. This fabulous quality is described by Pliny in his account of the plant. It is perhaps the same as the Springwort, famous in German legend for its use in opening treasure-chests. The legends connected with the fig-tree are very ancient and numerous. Under its boughs Adam concealed himself after tasting the forbidden fruit. Each blossom was inhabited by an evil spirit. In this particular instance it was a fig-tree that had grown over a tomb.

All of the herbs mentioned in the foregoing passage are described as magical herbs by Porta, Paracelsus and Agrippa.

A characteristic bit of malice on the part of the witches is described further on in the play of The Late Lancashire Witches, by Heywood and Brome, 1624. Joan has been preparing a dinner for some guests, when she breaks in upon them with this mournful story:

Joan. O husband, O guests, O sonne, O gentlemen, such a change in a kitchen was never heard of; all the meat is flown out o' the chimney-top, I thinke, and nothing instead of it but snakes, batts, frogs, beetles, hornets and bumble bees; all the sallets are turned to Jewes ears, mushromes, and puckfists; and all the custards to cowsheards.

The salads provided for this unlucky feast were all turned into fungi of various evil characters. The Jews' ears is the Auricula Judæ, a fungus resembling the human ear, which grows upon the elder, on which tree Judas was said to have hanged himself. The puckfist is the common puff-ball. Cowsheards, or cowshards, is cow-dung.

In a beautiful fragmentary play of Ben Jonson's, The Sad Shepherd, a similar scene is described. The hunting has been successful and the venison is laid before the fire, when a malignant witch, Maud, enters and utters this curse:

Maud. The spit stand still, no broches turn
Before the fire, but let it burn
Both sides and haunches, till the whole
Converted be into one coal.

Clarion. What devil's paternoster mumbles she?

Aiken. Stay, you will hear more of her witchery.

Maud. The swilland dropsy enter in
The lazy cuke and swell his skin;
And the old mort-mal on his shin
Now prick and itch withouten blin.

Clarion. Speak out, hag, we may hear your devil's matins.

Maud. The pain we call St. Anton's fire,
The gout, or what we can desire
To cramp a cuke in every limb,
Before they dine, yet seize on him.

The "swilland dropsy" is the watery dropsy. The "mortmal" is a term used by Chaucer, and means an ulcer; so "the old mort-mal on his shin" is a chronic ulcer of the leg, which was to prick and itch withouten blin—that is, without

ceasing—an appropriate torment for the cook, whose function required him to stand almost continually. What disease was meant by St. Anthony's fire has been much debated. It is most probable that it was ergotism, the Kriebelkrankheit of the Germans, a dry gangrene of the extremities, the effect of the continued use of rye-flour containing ergot. "Saint Anton fire thee!" was a common form of malediction.

It is an ancient belief that witches had power over the moon and could cause its light to change or disappear under the influence of their spells. Prospero describes Caliban's mother, "the foul witch Sycorax," as one "so strong that could control the moon." Centuries before Shakespeare's time the same belief prevailed, for Aristophanes introduces it in his comedy of The Clouds. Strepsiades tells Socrates that he has a plan to do away with paying of interest, for, says he:

If I were to buy a Thessalian witch, and draw down the moon by night, then shut her up in a round helmet-case like a mirror, and keep watching her—
Soc. What good would that do you then?
Strep. What? If the moon were not to rise any more anywhere, I should not pay the interest.
Soc. Because why?
Strep. Because the money is lent by the month.

The time of the full moon was especially favorable for gathering herbs for use in spells. In The Merchant of Venice, Jessica, sitting with the amorous Lorenzo in the brilliant light of the full moon, says:

On such a night
Medea gathered the enchanted herbs
That did renew old Jason.

The belief in astrology, as prevalent in classic as in recent times, had much to do with the witches' materia medica. The signs of the zodiac, with their fantastic relations to the human body, are still regarded with belief in their importance. A story is told of a well-to-do farmer who was ordered a purgative but who would not swallow it because he had looked in the almanac and seen that the sign for the month was in *bowels*, and he thought the two together would be too much for him.

Of all plants possessing necromantic endowments, the mandrake is the most famous. In our present pharmacopœias the name is appropriated to the harmless Podophyllum, but the old herbals term it the Atropa mandragora, its first name being derived from Atropos, one of the dreaded Parcæ. There are numerous allusions to it in the classic writers, and a well known one in Genesis, chapter xxx. The lad Reuben brings home mandrakes to his mother Leah. The barren Rachel begged them of the latter, and even gave up her husband Jacob for the night to her more fruitful rival, trusting doubtless to the supposed power of the root to cure sterility. There were said to be two forms of the mandrake, the male plant, which had a pleasant perfume, and the female, of which the leaves were large and had a rank odor. Cruden in his Concordance suggests that Reuben would naturally bring home to his mother only the sweet smelling plants of the harvest field, and the only other reference to the mandrake in the Bible is in Canticles vii. 13, where it is said, "The mandrake

gives a smell, and at our gates are all manner of pleasant fruits."

The account given of the mandragora by Pliny is interesting from a far-away hint at an anæsthetic. "It is given," he says, "before incisions or punctures are made in the body, in order to ensure insensibility to pain. Indeed, for this last purpose the odor of it is quite sufficient to induce sleep." It has been thought that the mandrake was identical with the Eryngium, a root which had a fancied resemblance to the genitals, and which Pliny says had been administered to Sappho and was the cause of her passionate love for Phaon.

Joannes Wierus, in his De presagiis dæmonum, Basel, 1563, states that Josephus describes a root called in the Hebrew, Baaras, which in the evening emits sparks of light. Like the mandrake, its extraction from the earth is attended with swift death to the person attempting it. To avoid this danger, a young dog which was kept without food for twenty-four hours was fastened to the root with a string, and upon meat being placed in advance of him he naturally rushed towards it, drawing out the root thereby. If the sun shone on the root the dog died suddenly, and was buried with secret ceremonies. A favorite habitat for the mandrake was the earth at the foot of a gibbet, the fat which dropped from the murderer's body encouraging its growth; when drawn from the ground it emitted shrieks like the cries of a human being, and death or madness fell upon the rash experimenter. It was partly a plant and partly an evil spirit, and it may be well supposed that with all these qualities it was a choice ingredient for the witches' potions.

There is preserved at Vienna, so Dr. Danberry relates, a manuscript copy of the work on Materia Medica of the Greek physician Dioscorides, who lived in the first or second century. It contains a curious drawing representing the goddess Discovery presenting to the author a mandrake freshly plucked from the earth. The root has an entirely human appearance, and the dog which had been employed to extract it is lying dead on the ground. The manuscript is of the fifth century.

The English romance-writer, William Harrison Ainsworth, who was deeply read in witch-lore, has embodied these beliefs regarding the mandrake in a spirited ballad, part of which may be quoted:

At the foot of the gibbet the mandrake springs,
Just where the creaking carcase swings:
Some have thought it engendered
From the fat that drops from the bones of the dead,
Some have thought it a human thing.
But this is a vain imagining.
And whether the mandrake we create
Flesh with the flower incorporate,
I know not; yet, if from the earth 'tis rent,
Shrieks and groans from the root are sent: . . .
Whoso gathereth the mandrake shall surely die;
Blood for blood is his destiny.
Some who have plucked it have died with groans
Like to the mandrake's expiring moans;
Some have died raving, some . . . .
With penitent prayers—but all have died.
Jesu! save us by night and by day
From the terrible death of mandragora!

Certain portions of the human body played an important part in the charms prepared by witches, such as the hair, the nails, blood, saliva, etc. Most of these entered into the composition of philters or love potions. If a love-sick maid could administer, in a cake or bread, cuttings from the hair or nails of the desired youth mixed with similar portions from her own person, he was certain to become madly in love with her. Among many tribes of North American Indians it is a custom still prevailing to bury the parings of the nails and portions cut from their hair, lest they should be employed for hurtful purposes. Dalyell, in his " Darker Superstitions of Scotland," relates that a young woman was indicted by the judicatories of Leipzig in 1623 for administering an amatory charm of bread compounded with hair and nails to a man whom it sickened (p. 219). The most important use of the human body was in the preparation of the unguent with which the witch anointed her body to enable her to fly through the air on her forbidden errands. Allusion has been made to this in some of the passages already quoted. John Wier, whose work is a perfect treasury of witch-lore, says that the proper method was to boil an unbaptised child in a caldron. The thick part of the concoction was made into an unguent, and the thinner part was bottled. " Whoso drank of the latter became immediately a companion of the order, a great clerk and master." Jerome Cardan gives a formula in which the fat of a child is mixed with parsley, aconite, cinquefoil, belladonna and soot. Probably the earliest specific account given of the use of such an ointment is to be found in The Golden Ass of Apuleius, written in the second century. Lucius, the hero, by the connivance of the waiting-maid, watches his hostess, a famous witch, while performing her necromantic rites in the privacy of her chamber at midnight. She anoints her body with an unguent, whereupon feathers and wings spring out, and thus transformed into a bird she flies out of the window. Lucius, determined to try the experiment upon himself, persuades the maid to bring him the ointment. She unintentionally fetches a different jar, and poor Lucius, to his horror, finds himself transformed into an ass. His adventures after being thus transmogrified form the subject of this celebrated romance.

Toward the end of the 16th century there flourished in Scotland a notable wizard named Doctor Fian, who was a schoolmaster. He became enamored of a young lady of great beauty, whose brother was one of his pupils. Failing to ingratiate himself with the sister, he resorted to " conjuring, witchcraft and sorcerie." The rest of the story shall be told as it is related in Pitcairn's Criminal Trials of Scotland, I, 213. So, " calling the said scholler to him demanded if he did lie with his sister, who answered he did : By means whereof he thought to obtain his purpose; and therefore secretly promised, to teach him without stripes, so he would obtain for him three haires from his sisters privities, at such times as he should spie best occasion for it, which the youth promised faithfully to perform, and vowed speedily to put it in practise, taking a piece of conjured paper of his master to lay them in, when he had gotten them : and thereupon the boy practised nightly to obtain his masters purpose, especially when his sister was asleep. But God, who knoweth the secrets of all

harts, and revealeth all wicked and ungodly practises would not suffer the intents of this divelish Doctor to come to that purpose which he supposed it woulde ; and therefore to declare that hee was heavily offended with his wicked intent, did so work by the gentlewomans owne meanes, that in the end the same was discovered and brought to light : for shee being one night a sleepe, and her brother in bed with her, sodainly cried outt to her mother, declaring that her brother wolde not suffer her to sleepe : Whereupon her mother having a quicke capacitie, did vehemently suspect Doctor Fians intention, by reason she was a witch of herself ; and therefore, presently arose, and was very inquisitive of the boy to understand his intent : and the better to know the same did beate him with sundrie stripes, whereby he discovered the truth unto her. The mother, therefore, being well practised in witchcraft, did thinke it most convenient to meete with the Doctor in his own arte : and thereupon took the paper from the boy, wherein hee should have put the same haires, and went to a yong heyfer which never had borne calfe, nor gone unto the bull, and with a paire of sheeres clipped off three haires from the udder of the cow, and wrapt them in the same paper, which shee again delivered to the boy: then willing him to give the same to his sayde master, which hee immediately did. The school maister, so soone as he had received them, thinking them indeed to be the maids haires, went straight and wrought his arte upon them. But the Doctor had no sooner done his intent to them, but presently the hayfer cow, whose haires they were indeede, came unto the door of the church wherein the school maister was, into the which the hayfer went, and made towards the school maister, leaping and dauncing upon him, and following him forth of the church, and to what place soever he went ; to the great admiration of all the townes men of Saltpans, and many others who did beholde the same. The report whereof made all men imagine he did worke it by the Devill, without whome it coulde never have been sufficiently effected : and thereupon the name of the saide Doctor Fian (who was but a young man) began to growe common among the people of Scotland, that he was secretly nominated for a notable conjurer."

There were other charges brought against the wizard at his trial beside the foregoing one, and the result was that the luckless doctor was burned at the stake in Edinburgh in January, 1591.

A cognate subject of investigation to that which we have been pursuing is the preservation against the power of witchcraft. It would lead us too far afield for the present occasion, and a very brief notice must suffice. English county folklore abounds in spells which had a protecting power, and plants under especial planetary influences were largely employed. They were purposely cultivated in domestic gardens, and many of the most beautiful flowering plants which have spread throughout England, and are to be found also in our own land, were brought from Palestine and Syria, and were first found in the extensive gardens of the monasteries. Among them were the wall-flower, the scarlet anemone or blood-drops of Christ, the blooming almond-tree, one of the symbols of the Virgin, and the marigold. These with many others found their place in art and are to be seen in illumin-

ated breviaries and in paintings, and were in high repute as preservatives from evil spells.

One of the most famous of these preservatives was the St. John's wort, or Hypericum. An old distich tells us that—

> Trefoil, vervain, John's wort, dill,
> Hinder witches of their will.

Baldur, the White God of the Norse Valhalla, was replaced in Christian days by St. John the Baptist. He was called the White Saint John in some old German and Gallic calendars. There are many relics of sun-worship still practised in Europe on St. John's day. Flowers with large sun-like discs were sacred to Baldur, and later to St. John the Baptist, and it was thus that the Hypericum obtained its name of St. John's wort and was believed to have especial power in repelling evil influences. From its handsome yellow flowers it obtained the name of the Rose of Sharon. Boiled in wine or ale it was a popular remedy for spitting or vomiting of blood. In Norway red spots on the plant are called St. John's blood, and are supposed to make their appearance on the day of his beheading, August 29th.

The Ash tree, and particularly the Rowan, or mountain ash, had a like celebrity, and sprigs of the latter were sewn in the dresses of children to protect them from ill. Rustics in Scotland still take with them a branch of Rowan tree when going a-milking, to prevent witches from drying up the cows.

The Vervain, or Verbena, was also a sacred herb. It was gathered with certain observances, and this verse was repeated during the process:

> Hail to thee, Holy Herb!
>   Growing on the ground;
> On the Mount of Olivet
>   First wert thou found.
> Thou art good for many an ill,
>   And healest many a wound;
> In the name of sweet Jesu
>   I lift thee from the ground.

Other protecting plants were the Cyclamen, Pimpernel, Angelica, Bracken, Fern, Rue, Broom, Maiden-hair, Agrimony and Ground-ivy. Yellow or green flowers growing in hedge-rows are especially repugnant to witches.

The Ash tree has a use in medicine which I fear is forgotten in these days. In the curious early Welsh book of treatment known as The Physicians of Middvai, written early in the 13th century, is a remedy for "Ulceration of the Ears," probably our otorrhœa. "Take the seed of the Ash, otherwise called the Ashen-keys, and boil briskly in the water of the sick man; foment the ear therewith, and put some therein on black wool." It is prudently added, "By God's help it will cure it." Black wool is an ingredient in many charms.

The English Folk-Lore Society recently published a reprint of a cutting from an old newspaper, without date, which describes the medical treatment of a woman who had been bewitched. It is a veritable curiosity in therapeutics, but it is to be thought that now-a-days we should call the affliction *hysteria*, and not bewitchment.

"They then gave to the said Magdalen Holyday the follow-

ing medicines:—Imprimis, a decoction—ex fuga Daemonium (St. John's wort)—of Southernwood, Mugwort, Vervain, of which they formed a drink according to Heuftius' Medical Epistles, lib. xii., sec. iv., also following Variola, a physician of great experience at the Court of the Emperor. They also anointed the part with the following embrocation:—Dog's grease well mixed, four ounces; bear's fat, two ounces; eight ounces of capon's grease; four and twenty slips of mistletoe, cut in pieces and powdered small with gum of Venice turpentine, put close into a phial, and exposed for nine days to the sun till it formed into a green balsam, with which the said parts were daily anointed for the space of three weeks, during which time, instead of amendment, the poor patient got daily worse, and vomited, not without constant shrieks or grumbling, the following substances:—Paring of nails, bits of spoons, pieces of brass (triangular), crooked pins, bodkins, lumps of red hair, egg-shells broken, parchment shavings, a hen's bone of the leg, one thousand two hundred worms, pieces of glass, bones like the great teeth of a horse, a luminous matter, sal petri (not thoroughly prepared), till at length relief was found, when well nigh given up, when she brought up with violent retching, *a whole row of pins stuck on blew paper!* After that, these sons of Æsculapius joyfully perceived that their potent drugs had wrought the designed cure —they gave her comfort, that she had subdued her bitter foe, nor up to the present time has she been afflicted in any way; but having married an honest poor man, though well to do in the world, being steward to Sir John Heveningham, she has borne him four healthy children. . . . Whether this punishment was inflicted by the said old woman an emissary of Satan, or whether it was meant wholesomely to rebuke her for frequenting wakes, may-dances, and Candlemas fairs, and such like pastimes, still to me remains in much doubt. 'Non possum solvere nodum.'

P. S.—I hear the physicians followed up their first medicine with castory, and rad. ostrutii and sem. danci, on Forestius' his recommendation."

The radix ostrutii was, I suspect, the root of Imperatoria ostruthium, or Masterwort. It is regarded as a powerful stimulant and emmenagogue, and such was its reputation that it was termed *remedium divinum*. The *semina danci* must be a misprint for *semina dauci*, the seeds of the carrot, which were held to be diuretic and aromatic. Forestius's work, published in 1589, is a collection of curious cases with still more curious treatment.

The Elder-tree has been mentioned in some of the previous passages, and there were many strange superstitions connected with it. The "fox-headed Judas," as an old writer termed him, alluding to the color of his hair, was believed to have hanged himself upon an Elder tree, and that entirely credible writer, Sir John Maundeville, declares that he saw the veritable tree while in the Holy Land. There is a curious bit of folklore relating to the Elder, well known as amulet to preserve witches, who rode on broomsticks in their night journeys. Coles, in his "Art of Simpling," 1656, says:

"It hath been credibly reported to me from several hands, that if a man take an Elder-stick and cut six or seven sides, so that he preserve the joints, and put in his pocket when he

rides a journey, he shall never gall." Richard Fleckno, in his Diarium, 1658, also tells us:

> How Alder-stick in pocket carried
> By horseman who on highway feared [fared],
> His breech should nere be gall'd or wearied,
> Although he rid on trotting horse,
> Or cow, or cowl-staff, which was worse.
> It had, he said, such vertuous force,
> Whose vertue oft from Judas came,
> (Who hang'd himself upon the same,
> For which, in sooth, he was to blame)
> Or 't had some other magick force
> To harden breech, or soften horse,
> I leave 't to th' learned to discourse.

In The Athenian Oracle, once edited by Samuel Wesley, brother of the famous John Wesley, is a confirmatory story. "A friend of mine," says the relater, "being lately upon the road a horseback, was extremely incommoded by loss of leather; which coming to the knowledge of one of his fellow travelers, he over-persuaded him to put two Elder sticks into his pocket, which not only eased him of his pain, but secured the remaining portion of posteriours not yet excoriated, throughout the rest of his journey."

It is much to be desired that this very valuable information should be made known to the members of the Hunt and to young cavalrymen going into the field.

In conclusion, it may be said as worthy of observation that the witches in Middleton's play, as well as those who figure in the other dramas from which quotations have been given, are of a somewhat vulgar type. Their purposes are purely malicious. Their names even are appropriate to their character. They are spoken of as Mother Bombey, Mother Demdike, Mother Sawyer, and the like. In Macbeth they are simply the "three weird sisters." The only one named is their queen, Hecate. They appear suddenly on the heath of Forres, in thunder and lightning, and after their fell work is done they vanish to aerial music. Their purpose, though malignant in the extreme, is of a lofty kind. They inspire Macbeth with ambitious hopes which lead him to the murder of the "gracious Duncan," and after a career of bloody tyranny end in his own destruction. There is in this the leading feature of the Grecian tragedy, that of irresistible fate. This is Shakespeare's method of handling the subject. The ordinary witch dreads the constable and the justice, but, as Charles Lamb observes, it would be "a hardy sheriff with the power of a county at his back, that would lay hands on the weird sisters."

In the play of The Witch of Edmonton, written conjointly by Rowley, Decker and Ford, there is a strong passage which,

I think, must have been written by Ford. The witch has lost her familiar imp, who had been sent to perform some diabolic work, and she invokes his return thus:

> Not see me in three days?
> I'm lost without my Tomalin; prithee come;
> Revenge to me is sweeter far than life;
> Thou art my raven, on whose coal-black wings
> Revenge comes flying to me; O, my best love,
> I am on fire (even in the midst of ice)
> Raking my blood up, till my shrunk knees feel
> Thy curl'd head leaning on them. Come then, my darling.
> If in the air thou hoverest, fall upon me
> In some dark cloud; and as I oft have seen
> Dragons and serpents in the elements,
> Appear thou now to me. Art thou i' the sea?
> Muster up all the monsters from the deep,
> And be the ugliest of them: so that my bulch*
> Show his swarth cheek to me, let earth cleave,
> And break from hell, I care not: could I run
> Like a swift powder-mine beneath the world,
> Up would I blow it, all to find out thee,
> Though I lay ruin'd in it.—Not yet come?

The raven, alluded to in this passage, from his solemn hoarse voice and sable plumage, has been at all times regarded as a bird of ill omen. His croak announced approaching death. Marlowe, in his Jew of Malta, describes him as—

> The sad presaging raven, that tolls
> The sick man's passport in her hollow beak;
> And in the shadow of the silent night
> Doth shake contagion from her sable wings.

Lady Macbeth, sure of herself in the intended tragedy, exclaims:

> The raven himself is hoarse
> That croaks the fatal entrance of Duncan
> Under my battlements.

In the Korán (Sura V, 30-35, Sale) the raven is connected with the murder of Abel. Cain did not know how to conceal the body of his slaughtered brother, but, says the text, "God sent a raven, which scratched the earth to show him how he should hide the shame of his brother. And he said, 'Woe is me! am I unable to be like this raven, that I may hide my brother's shame?'"

The feathers of the bird had their appropriate uses, and Caliban in his curse exclaims:

> As wicked dew as e'er my mother brush'd
> With raven's feather from unwholesome fen,
> Drop on you both.

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* Bulch, bulchin, an urchin, a hobgoblin.

FURTHER OBSERVATIONS UPON THE TREATMENT OF MALIGNANT TUMORS WITH THE TOXINS OF ERYSIPELAS AND BACILLUS PRODIGIOSUS, WITH A REPORT OF 160 CASES.*

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Abstract.

The cases reported extend over a period of upwards of four years, and they embrace nearly every variety of sarcoma and carcinoma. In practically all the cases the diagnosis was confirmed by microscopic examination made by the most competent pathologists. In addition, the majority of the tumors had been pronounced inoperable by leading surgeons, and in many cases still further evidence of malignancy was furnished by a history of repeated recurrence after operation.

It would seem possible from this large series of cases to arrive at some scientific opinion as to the value or worthlessness of the toxins in malignant tumors. The fact was emphasized that this method of treatment had been advocated only in inoperable cases which were entirely hopeless, not only from a surgical standpoint but also as regards any other hitherto known method of treatment. The author expressed the desirability of having these results subjected to the severest criticism. If they were able to stand this they would be of the greatest importance, not only as bearing upon the future treatment of malignant tumors, but also as throwing some light upon the unsolved problems of the etiology and pathology of such tumors.

An attempt was made to show that the method of treatment rested upon a rational basis, namely, the considerable number of cases of undoubtedly malignant tumors that had been permanently cured by attacks of accidental erysipelas. The writer's own observations covered the whole field from the accidental erysipelas to the mixed toxins. He was led to take up this line of investigation from having observed a small, round-celled sarcoma of the neck, five times recurrent, and given up as hopeless, cured by an attack of accidental erysipelas, patient having been found alive and well seven years afterward. His first series of ten cases were treated with repeated injections of living bouillon cultures, with the view of producing erysipelas. The unmistakable improvement that followed the repeated injections, even when no erysipelas was produced, especially in sarcoma, suggested that a portion, if not all of the beneficial influence was due to the toxins instead of the living germ, and this led to experiments with the toxins alone.

The first experiments were conducted with bouillon cultures that had been subjected to 100° C. and were used without filtration. The reactions following the injections of this solution were similar in character to those obtained from injections of the living germ, although less severe. In order to increase the virulence of the cultures, the writer made use of the fact demonstrated by Roger, that the bacillus prodigiosus, a non-pathogenic organism, had the power of intensifying the virulence of the streptococcus of erysipelas. The toxic products of the two germs were prepared separately and mixed at the time of using.

This mixture produced a much more severe reaction than when the erysipelas was used alone, and the beneficial influence upon the tumor was likewise more marked. Later on, at the suggestion of Mr. B. H. Buxton, the two germs were grown together in the same bouillon, the erysipelas being grown alone for 10 days and the bacillus prodigiosus added and the two allowed to grow together for another week or 10 days, at the end of which time they were passed through a Kitasato filter. This appeared to be a still greater improvement in technique.

A still further change was made with a view of utilizing whatever of value might exist in the insoluble products remaining in the dead germs; the cultures were heated in a temperature sufficient to render them sterile, which was found to be 58–60° C. for one hour. By the addition of a little thymol the fluid could be kept indefinitely in glass-stoppered bottles. This preparation was much stronger than those before described, and experience proved it to be much superior to the others in its action upon the sarcoma. An analysis of the cases treated showed that 48 were round-celled sarcoma, 13 spindle-celled, 7 melanotic, 2 chondro-sarcoma, 3 mixed celled, 14 sarcoma, special type not known. Total number of cases of sarcoma 93; carcinoma and epithelioma 62 cases; sarcoma or carcinoma 10; tubercular 2; fibro-angioma 1; mycosis fungoides 1; goitre 2; keloid 1. Of the cases of sarcoma, nearly one-half showed more or less improvement; the variety that showed the greatest improvement was the spindle-celled; that which showed the least, the melanotic. Next in order of benefit was the mixed celled—round and spindle: then round-celled, while osteo-sarcoma closely approached the melanotic in showing but little change. In a series of 9 cases of melanotic sarcoma, no improvement was noticed in 6, very slight in 3. Most of the cases of osteo-sarcoma failed to respond to the treatment, many showed slight improvement, and one case, a very large osteo-chondro-sarcoma of the ilium, apparently disappeared and the patient remained well for nearly a year, when a recurrence occurred. One case of round-celled sarcoma of the neck of very rapid growth showed very marked decrease during the first week's treatment, after which time it continued to grow in spite of large doses of the toxins.

Report of Successful Cases.

The cases most worthy of especial note were the following:
Case I.—A twice recurrent inoperable sarcoma of the neck with large secondary sarcoma of the tonsil.

Last operation performed by Dr. Wm. T. Bull, March, '91. The tumor was so extensive that only a portion could be

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removed; the general condition of the patient, May 4, 1891, was so bad that he was expected to live but a short time. He could swallow no solid food, and liquids with difficulty. He was treated from May 4 until October 8, 1891, with repeated local injections of living cultures of streptococcus of erysipelas; decided improvement followed the injections, and whenever they were discontinued for a short time the growth increased in size. On October 8 a severe attack of erysipelas was produced by using a new and more virulent culture. During this attack the tumor of the neck nearly disappeared, the tumor of the tonsil decreased in size; general condition of the patient rapidly improved and he had soon regained his usual health and strength. He has had no treatment since. He was last seen in September, 1895, four years later, at which time the tumor of the tonsil, though still present, had greatly shrunken in size; there was a small mass at the site of the old scar in the neck, apparently made up of cicatricial and fibrous tissue.

Microscopic Report.

[Copy from Records, N. Y. H. Laboratory.]

SPEC. NO. 1870.—REPORT OF MICROSCOPICAL EXAMINATION.

Operation, a piece of tumor about the size of an orange was removed, but a portion yet remains, being too deeply seated for extirpation.

Microscopically the tumor is composed of fibrous tissue and spindle cells, the fibrous tissues predominating in places and in others the spindle cells.

There are many areas of cells resembling mucous cells, and not to be differentiated from myxomata; vascular supply abundant and vessel walls formed by tumor tissue.

Diagnosis, "myxo-sarcoma."

FARQUHAR FERGUSON, M. D.,
Pathologist to the New York Hospital.

Case II.—Large recurrent sarcoma of the back and groin; entire disappearance of both tumors; patient in perfect health, without recurrence four years after the beginning of the treatment, and more than three years after the cessation of the treatment.

Patient male, aged 40; sarcoma of the back and lower lumbar region 7x4 inches, with a secondary tumor the size of a goose-egg in the groin. The groin tumor was removed by operation, January, 1892; it rapidly recurred. Patient was examined by Dr. Wm. T. Bull and several other surgeons, who all regarded the case as inoperable. Diagnosis of sarcoma was made and confirmed by Dr. Farquhar Ferguson's (pathologist to the New York Hospital) examination of a portion removed under cocaine.

Treatment by repeated daily injections of living bouillon cultures of erysipelas was begun in April, 1892. At the end of two weeks a severe attack of erysipelas was produced. At the end of three weeks both tumors had entirely disappeared. Recurrence followed in July, and the tumors, both in the back and the groin, grew more rapidly than before. The injections were resumed, and between October, 1892, and January, 1893, the patient had four additional attacks of erysipelas; they were milder in character, and the effect upon the tumor was less striking.

In January, 1893, the tumor in the back was removed, but that in the groin left undisturbed. At the end of three weeks there was an apparent recurrence in the back, and the injections with the mixed toxins of erysipelas and bacillus prodigiosus were then begun. Both tumors quickly disappeared. Treatment was discontinued in March, 1893; patient has been in perfect health, free from recurrence since.

Pathological Report.

[Copy from Records, N. Y. H. Laboratory.]

The tumor is a sarcoma, in which the cells are round, oval, and spindle, in which everywhere there is seen a stroma of fibrous tissue, apparently the remains of the subcutaneous tissue which has not been completely destroyed during the development of the tumor. Yellow elastic fibres are quite abundant throughout the tumor, but the vascular supply is not very abundant.

FARQUHAR FERGUSON, M. D.,
Pathologist to the New York Hospital.

Case III.—Large inoperable sarcoma of the abdominal wall and pelvis; entire disappearance of the tumor; no recurrence three years after.

The patient, a boy of 16 years of age, had a tumor 7x5 in. in extent, involving apparently the entire thickness of the abdominal wall, attached to the pelvis, and judging from the symptoms and position, evidently involving the wall of the bladder. A portion of the tumor was removed, and pronounced spindle-celled sarcoma, by Dr. H. T. Brooks, pathologist of the Post-Graduate Hospital. The case was regarded as inoperable by Prof. L. Bolton Bangs and referred to Dr. Coley for treatment with the toxins. Patient was admitted to the N. Y. C. H., Jan., 1893, treated for three months with the mixed filtered toxins. At the end of that time the tumor had nearly disappeared, and the remainder was gradually absorbed after the injections were discontinued; there was no breaking-down of the tumor tissue; patient has been in perfect health up to the present time, more than three years after cessation of treatment.

Pathologist's Report.

Spindle-celled sarcoma.

H. T. BROOKS, M. D.,
Pathologist to the Post-Graduate Hospital.

Case IV.—Large inoperable sarcoma of the abdominal wall; entire disappearance; no recurrence 2½ years afterward. The patient a woman, 28 years of age.

Exploratory operation had been performed in August, 1893, by Dr. Maurice H. Richardson, of the Massachusetts General Hospital. The tumor was too large to be removed; a portion was excised for microscopic examination. The diagnosis made by Dr. W. F. Whitney, pathologist to the hospital, was fibrosarcoma. The patient was sent to Dr. Coley by Dr. Richardson for the erysipelas treatment. The injections with the mixed toxins were begun in October, 1893, and continued for 10 weeks; the tumor entirely disappeared. The patient is still in perfect health, with no trace of recurrence.

Pathologist's Report.

August 31, 1893.

The specimen from the tumor of the abdominal wall (Mrs. L.) was a small, dense, ill-defined, whitish, fibrous-looking mass, which

on microscopic examination was found to be made up of large numbers of small cells with a tendency to form fibres. This latter condition was more marked in some places than others. The diagnosis is fibro-sarcoma.   W. F. Whitney, M. D.,

Pathologist to the Massachusetts General Hospital, Curator Warren Museum, Harvard Med. School.

Case V.—Spindle-celled sarcoma of the leg. Popliteal region. Three times recurrrent. Disappearance. Recurrence in gluteal region after one and a half years.

The patient, a girl, 15 years of age, had undergone three operations by Dr. Wm. T. Bull, for spindle-celled sarcoma starting in the metatarsal bone. In January, 1894, a tumor the size of a child's head was removed from the popliteal region. The one in the stump, the size of a hen's egg, was left to test the value of the toxins. Complete removal of the tumor in the popliteal region was impossible. The toxins were administered at the N. Y. H., under Dr. Bull's direction, for about 2 months; treatment was continued at the N. Y. Cancer Hospital by Dr. Coley. The indurated mass in the calf slowly disappeared; tumor in the stump also disappeared.

Patient remained well for 1½ years. At the end of that time there was a recurrence in the gluteal region. The toxins were again administered; the tumor diminished in size, and in February, 1896, was removed.

Pathological Report.

Tumor the size of a child's head, measuring 9x7x4½ centimeters, is partly surrounded by a smooth capsule, but presents many freshly incised surfaces; whitish in color; very firm; of little vascularity, and presenting the appearance of fibro-sarcoma.

Microscopic examination of the tumor shows the typical structure of a fibro-sarcoma, with sarcoma elements predominating; vascular supply fairly predominant.   F. Ferguson, M. D.,
Pathologist, New York Hospital.

Case VI.—Extensive spindle-celled sarcoma of the scapula and chest-wall; entire disappearance of the tumor under three months' treatment; patient at present in perfect health; no trace of recurrence 23 months later.

The patient, a girl, aged 16 years, was admitted to the "incurable ward" of the New York Cancer Hospital on June 20, 1894. The tumor apparently started in the region of the left scapula, 4 months before, and extended to the vertebral line behind, and in front to the edge of the sternum; it was fixed to the chest-wall, measured 13 inches behind, 7 inches in front. The left arm was bound down by the new growth so that it could not be raised to a horizontal position; the skin was normal; there were no general or local signs of inflammation. A portion of the tumor was removed for microscopic examination and a diagnosis of typical spindle-celled sarcoma was made by Dr. H. T. Brooks, pathologist to the Post-Graduate Hospital. The patient was treated for three months with daily injections of the mixed unfiltered toxins; improvement was immediate and the tumor very rapidly disappeared by absorption. Patient remains in perfect health at the present time.

Pathologist's Report.

Typical spindle celled sarcoma.
                              H. T. Brooks, M. D.
Pathologist to the Post-Graduate Hospital.

Case VII.—Intra-abdominal round-celled sarcoma of mesentery and omentum; disappearance; patient well, without evidence of recurrence 1½ years later.

The patient, female, aged 23 years, was operated upon by Dr. Willy Meyer at the German Hospital, in August, 1894. A small tumor involving the mesentery, omentum, large and small intestine, was found and removal considered impossible. Portion was excised for examination and pronounced by Dr. Schwytzer, the pathologist of the German Hospital, "round-celled sarcoma." Patient was referred to Dr. Coley for treatment with the toxins. Injections were given in the gluteal region and abdominal wall for about six months, with occasional intervals. In February, 1896, an attempt was made to close the sinus in the abdominal wall which had persisted since Dr. Meyer's operation. The sinus was found to lead into the gall bladder and several impacted gall-stones were removed; careful exploration of the abdomen failed to reveal the presence of any tumor. Patient perfectly well, August 7, 1896.

Case VIII.—Epithelioma of the chin, lower jaw and floor of mouth; entire disappearance; patient perfectly well two years later.

The patient, a woman 34 years of age, was admitted to the Methodist Episcopal Hospital in May, 1894. A rapidly growing tumor was found, involving lower jaw, floor of mouth and soft part of the chin, extending over an area about the size of a silver half-dollar, presenting the appearance of a typical epitheliomatous ulcer. The patient was regarded as inoperable by Dr. Geo. R. Fowler; a portion of the growth was excised and diagnosed as epithelioma, by Dr. Wm. N. Belcher, pathologist to the hospital. The patient was treated at the N. Y. C. H. from June, 1894, till September, 1894, with the mixed unfiltered toxins. There is no trace of the tumor to be found at present and the woman is in perfect health (July, 1896).

Pathologist's Report.

Material from chin and lower jaw, May 20, 1894. Sections were not entirely satisfactory, but from gross appearance of the materials and those revealed by the microscope the diagnosis of epithelioma is offered.   W. N. Belcher, M. D.

Case IX.—Enormous osteo-chondro-sarcoma of the ilium: tumor disappeared; patient regained his usual health and remained well for seven months, at which time a recurrence occurred. The tumor has resisted further treatment: the patient, although alive, is in a hopeless condition.*

Case X.—Spindle-celled sarcoma of the hand, 6 times recurrent; remained well for one year, then recurred.

Case XI.—Very large, twice recurrent angio-sarcoma of the breast; treated for six months with the erysipelas and prodigiosus serum; marked reduction in size, making the tumor easily removable; excision, September, 1895; no recurrence, February 8, 1896.

The patient, a woman aged 40 years, was admitted to the N. Y. C. H. on January 20, 1895; had a very large recurrent tumor in the region of the left breast, extending from the sternum to the mid-axillary line; the tumor was fixed to the

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* Patient died, July, 1896.

chest-wall, and entirely inoperable; patient was extremely weak. She improved slowly under the local injections of the erysipelas serum, and in September the tumor had become so much reduced that it was easily excised.

Microscopical Report.

I have examined a large number of sections from different parts of the tumor of breast of No. 207, and although there is considerable diversity in detail of the new growth in different parts, I think that the structures are all referable to the type of angio-sarcoma, which accordingly is the anatomical diagnosis.

T. MITCHELL PRUDDEN, M. D.

Case XII.—Large inoperable round-celled sarcoma of the iliac fossa; treatment was begun in June, 1893; tumor almost entirely disappeared; patient was in good health, August, 1894, after which time he was lost sight of.

Case XIII.—Probable sarcoma of the sacrum; disappearance of tumor; complete restoration to health.

The patient, male, 38 years of age, began to lose flesh and strength in February, 1895. Later had severe pains in lower portion of the spine and sacrum, shooting down the legs. April 1, began to get lame in the right leg; soon after in the left; all of the symptoms progressively increased, and on the 2d of May his weight had fallen from 175 to 134 pounds. He was admitted to Dr. Kinnicutt's service at St. Luke's Hospital; rectal examination showed a tumor, hard in consistence, attached to the anterior portion of the sacrum, the lower portion of which only could be reached with a finger. Clinical diagnosis of Dr. Kinnicutt and the others who saw the patient in consultation was inoperable sarcoma. No microscopic examination was made. A two to three weeks' trial with the erysipelas toxins was advised by Dr. Coley. The improvement was almost immediate; injections were made into the buttocks; treatment was repeated daily, and at the end of one week the excruciating pain had almost entirely subsided, the lameness improved rapidly, and at the end of six weeks the patient had gained 28 pounds and was able to resume his work. Examination, March 8, 1896, showed the patient to be in perfect physical health; his lameness had disappeared; no trace of a tumor could be detected on rectal examination; his weight at that time was 175 pounds.

Several other cases in which very marked improvement had followed the use of the toxins were reported.

Attention was further called to nine successful cases in the hands of other surgeons who had used this method. The most important of these were the following:

Case 1.—A large spindle-celled sarcoma involving almost the entire palate and pharynx.—This case, it was stated, had already been reported in the New York Medical Record, November 17, 1894, but its value was greatly enhanced by the fact that there had been no recurrence two years afterwards.

Case 2.—Extensive inoperable intra-abdominal sarcoma, reported by Dr. Herman Mynter of Buffalo, in the New York Medical Record, February 9, 1895. In this case the tumor disappeared, and up to April, 1896, there had been no recurrence.

Cases 3–6.—Drs. L. L. McArthur and John E. Owen of Chicago had had three successful cases, although sufficient length of time had not elapsed to determine whether or not

they could be classed as cured. All of the cases were recurrent, and in two amputation of the leg had been advised; in a third, amputation of the arm.*

Case 7.—Czerny of Heidelberg, who has used the method in four cases of sarcoma and in four of carcinoma, has reported one case of rapidly growing, inoperable, round-celled sarcoma of the parotid which nearly disappeared under the influence of 18 injections. The case has been more recently referred to as cured, by Glueckmann.

Case 8.—Dr. Judson C. Smith, of the Post-Graduate Medical School, had a case of small round-celled sarcoma of the neck, the size of an orange, disappear entirely under eight weeks' treatment with the mixed toxins. Microscopic examination was made. Patient gained 25 pounds in weight, remained well for a number of months, at the end of which time a recurrence took place.

Cases 9–10.—Two other successful cases were briefly reported, both of which were confirmed by microscopic examination; both cases were recent, and therefore could not be classed as permanent cures.

The writer stated that he did not expect the profession at large to accept without question and criticism such remarkable results as he had reported, and for that reason he had related with some detail the successful cases in the hands of other surgeons who had employed this method. He was of opinion that a series of upwards of 20 successful cases of inoperable sarcoma (four of which had remained well upwards of 2½ years), the diagnoses of which had been established beyond question according to accepted methods of diagnosis, ought to be sufficient to demonstrate the real and positive advance that had been made in a field which, up to this time, had been regarded as absolutely hopeless. He did not doubt that there were those who would still remain skeptical about the value of the toxins in spite of the evidence presented. Such persons must either fail to see any logical connection between the accidental erysipelas and the toxins, or they must go even farther and deny that there are any authentic cases of malignant tumors that were cured by accidental erysipelas. The only explanation they can have to offer for the results which cannot be questioned is, that in all the successful cases there must have been an error of diagnosis.

Such an explanation might be entitled to some consideration were a single case only involved, but those who would seriously propose it as a satisfactory explanation in view of the results in more than 20 cases, could not claim to be guided by scientific principles. The writer stated that he had carefully examined the literature of the subject of spontaneous disappearance of tumors supposed to be malignant, but had failed to find a single instance in which the diagnosis had been confirmed by the microscope. It would appear remarkable that these cases should be the first on record with a clinically and microscopically confirmed diagnosis to disappear spontaneously, and it would seem more remarkable still that this disappearance should be coincident with the beginning of the treatment with the toxins.

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* In two of these cases there was a suspicion of recurrence in April, 1896.

Furthermore, it would be clearly unfair to rule out these cases on the ground of error in diagnosis, without ruling out the cases of cure following operation, for the same reason.

The writer then briefly referred to the various theories that had been offered in explanation of the action of the toxins. He still adhered to his opinion, expressed in his earlier paper, published in December, 1892, that the micro-parasitic origin of malignant tumors furnished the only rational explanation of this action. His conclusions were, 1) that the mixed toxins of erysipelas and bacillus prodigiosus exercise an antagonistic and specific influence upon malignant tumors, which influence in a certain proportion of cases may be curative. 2) That the influence of the toxins is very slight in most cases of carcinoma, including epithelioma, most marked in sarcoma, but that it varies greatly with the different types, the spindle-celled form being by far the most responsive to the treatment. 3) That the action of the toxins is not merely local in character, but systemic. 4) That the toxins should be reserved for use in clearly inoperable cases of sarcoma, or in cases after primary operation, to prevent recurrence.

DISCUSSION.

Dr. WELCH.—I have been very much impressed by this personal statement from Dr. Coley, and I see no way of gainsaying the evidence which he has brought forward, that there is something specifically and genuinely curative in his method of treatment. A single undoubted cure of a demonstrated cancer or sarcoma by this treatment would be enough to establish the fact that the treatment exerts some specific curative effect, for the spontaneous disappearance of undoubted malignant growths of this character is almost unknown. Dr. Coley has, however, presented to us positive proof of the cure, not of one only, but of several cases of malignant tumor by his method. Although I suppose that in any given case the chances of cure by this method are at present not great, still the demonstration that cure is possible gives every encouragement for perseverance in this line of investigation and work, and for efforts to perfect the method of treatment.

It is interesting to learn that the most strikingly beneficial results have been obtained in the treatment of spindle-celled sarcomata. There are certain kinds of sarcomata which some pathologists are inclined to rank rather among the infectious tumors than among the genuine tumors, in the sense in which these terms are used by Cohnheim; but it is rather certain sarcomata of the lymphoid type than the fusiform-celled sarcomata which are thus believed to be possibly outside of the class of genuine tumors, according to Cohnheim's classification.

As Dr. Coley suggests that the variations in his results may depend in part upon variations in the virulence of his cultures, and as it is well known that streptococci vary notably in virulence, I would like to ask if he has as yet utilized the methods of Marmorek in order to obtain cultures of uniformly high degrees of virulence. Dr. Livingood in my laboratory has confirmed the results of Marmorek and succeeded repeatedly by his method in transforming streptococci of low virulence into those of very exalted virulence.

It seems to me that it would be practicable and most interesting, and possibly demonstrative of the specific effects of the treatment, if Dr. Coley, in carrying out his researches, would occasionally cut out small bits of tissue from the tumor and by their examination endeavor to determine the details of the process of cure.

It does not seem to me absolutely necessary to adopt the hypothesis of the parasitic causation of these malignant growths in order to explain their disappearance under this treatment. It is conceivable that the peculiar biological properties of the tumor cells—and peculiar they unquestionably are—may render them particularly susceptible to the toxic substances injected. The evidence that the curious bodies often seen in malignant tumors are genuine parasites is, in my opinion, far from conclusive at the present time.

Dr. FINNEY.—I have had the opportunity of observing the action of both the erysipelas organism and the toxin in a number of cases, both in hospital and private practice. One point which Dr. Coley has not mentioned to-night, but which he has referred to previously, I will speak of, because I think it of great value. It is the influence of the treatment on cases which may not finally result in a cure. The first case in which I used the erysipelas occurred about the time Dr. Coley began to make his observations in New York. It was a case of a woman with inoperable carcinoma of both breasts. Against my will, but at the urgent request of herself and her husband, I inoculated with a pure culture of the erysipelas streptococcus. She had at the time a very distressing and severe cough, with intense pain, evidently from involvement of the pleura. She had also evidences of internal metastases. After the first reaction from the erysipelas the pain almost entirely disappeared, and did not reappear with severity while the patient lived. She had been almost constantly under the influence of morphia up to the time of the inoculation, and after that time she had only a little codein from time to time to relieve her cough, which persisted after the pain had disappeared. I observed a similar action in another case. I think this patient lived three months after the inoculation. She gradually wasted away, more from inanition resulting from the internal metastases.

I had one case of inoperable carcinoma of both breasts, in which it was impossible to produce any reaction from the erysipelas. I injected it under the skin. I scarified and dressed the wounds in pure cultures in large amounts in very virulent erysipelas without getting the slightest reaction. Of course there was no result from this case.

I would like to ask Dr. Coley whether he has ever observed any cumulative effect of the toxins? In one or two cases it seemed as if that had happened. After a number of injections with gradually increasing doses, without any reaction, a sudden tremendous reaction would take place while still subsided, and then for a varying length of time there would be no reaction, even with larger doses than were used previously.

I have observed no cases up to the present time where there has been a cure. But unfortunately, all the cases in which I have used it, except one under treatment at the present time, have been either carcinoma or cases of sarcoma that were beyond hope from any source.

Dr. COLEY.—I have been very much interested in the discussion and I think I have gained as much from it as any one. I was particularly interested in the remarks of Dr. Welch. I did not mean to make quite so strong a statement in regard to the parasitic theory ; I should have said that that was the way it appeared to me.

I have used the streptococcus from all sources, but the streptococcus from a virulent case of erysipelas seems to have a better effect than a streptococcus from an abscess.

I have used Marmorek's method somewhat. Mr. Buxton has repeatedly passed the cultures through rabbits, and he had been doing it for some time before Marmorek's paper came out. That is the way, I believe, in which improvement in technique is to come, along the lines which Marmorek has shown us, in increasing the virulence of the cultures.

I will say, in answer to Dr. Bloodgood's question regarding metastases, that the patient with sarcoma of the back and groin was a case of marked metastases, the tumor being the size of a goose egg and also recurrent in the groin. That case has remained well over three years since the cessation of treatment.

A case which I published a year ago, treated by Dr. Rumgold of San Francisco, was one in which a round-celled sarcoma reappeared eight times in the breast. It disappeared under the mixed toxins, but the patient died a few weeks later. Autopsy showed very extensive metastatic deposits in the internal organs. In this case the external growth had been cured, but the internal growths were too far gone to be influenced.

About removing specimens during the course of the treatment, as suggested by Dr. Welch, I will say that I have done that in a considerable number of cases. In many of these cases a marked fatty degeneration and necrosis of the malignant cells were clearly visible under the microscope. I shall try to show these changes in micro-photographs of the sections.

In regard to intra-orbital sarcomata, I have not had an opportunity of treating such cases before removal of the eye. I have had four or five cases of recurrent tumors in the orbit after the eye had been enucleated. The effects were very slight, if any. They were all melanotic or round-celled sarcomata.

As to the safety of the treatment, I think that if the cases are selected with some judgment the injections can be used with almost perfect safety. I have had three cases in which I am sure death was hastened by the use of toxins. In one case I ought not to have used the treatment. There was an enormous sarcoma of the scapula and chest wall. The patient was so much emaciated that he could not have lived more than a couple of weeks, but with two very minute doses of the weaker solution of the toxins he lived only three days.

The differences obtained by the same doses at different times is best explained, I think, not by cumulative action, because that is not clearly proven, but by the fact that the reaction is greatly increased when the injection is made into a more vascular part. A patient can stand perhaps five to ten times as much injected subcutaneously remote from the tumor as he can injected into a vascular tumor. Sometimes we inject into a part that is more vascular than others, and to this is to be attributed the difference in reaction. I always caution any one to begin with the minimum dose and increase it very gradually. One half a minim of the unfiltered mixed toxins is sufficient for the initial dose.

THE PSYCHICAL NERVE CELL IN HEALTH AND DISEASE.*

BY HENRY J. BERKLEY, M. D.

The cortex of the brain of all mammals contains a large variety of different forms of nerve cells. Among these, and perhaps three-quarters of the whole number, are certain cells of peculiar form and character which are not present in other parts of the nervous system, and probably subserve as the substratum of the mental functions, and accordingly they have been named the *psychical* nerve cells.

Of these cells there are two varieties—a small and a large form—only differing anatomically in their size, the other characteristics being equal. The small cells occupy the region of the cortex comparatively close to the surface of the brain, the others are more deeply situated.

The body of the cells is of pyramidal or conical form. Out of the superior portion departs what is known—from its early origin—as the primordial process, which at some distance from the cellular body branches and rebranches until it assumes the outspreading appearance of a tree. Out of the basal portion of these cells also proceed extensions, which correspond to the roots of the tree, and may be either few or many in number.

The uppermost branches of the psychical cells reach high up into the outer lamina of the cortex, where they come into contiguity with the endings of the very numerous nerve fibres that arise from the medullated masses at the foot of the convolutions, or have their source within the cortical layers and ascend toward the brain surface.

So far, except in shape, the psychical cells do not differ from other nerve cells in the brain-rind, but if we look a little closer at the branches of the neurons, we will find that they are thickly studded with short lateral projections, the majority of these having the form of a round-headed pin with the sharp point set into the protoplasmic substance of the stems. These peculiar lateral projections, or gemmulæ, are present to some extent on other cortical cells, but have not the full development they possess with the psychical, and accordingly it is reasonable to suppose they have peculiar attributes differing from other cells.

Let us consider for a moment their probable function. Surrounding the branches or dendrites of the cells is a maze of

innumerable fine nerve fibres, and from these filaments are given off at frequent intervals, which, after branching and rebranching a number of times, end in little bulbs that constitute the intracortical end-apparatus of the nerve fibres. Now these little bulbar endings come into very close approximation with the globular ending of the gemmules, and it is exceedingly probable that the nervous forces passing from cell to cell, or the external impressions conveyed centralwards from the peripheral organs to the nerve centres, overleap the slight barrier between the ending of the nerve fibre and the bulbous ending of the gemmule, and through the medium of the latter are continued on toward the cell body, where, acting as a temporary irritant, they excite the cells to action, and a thought or motor impulse is engendered.

Besides the protoplasmic processes, another even more important portion of the psychical cell has its origin in the basal region. The axon, or axis cylinder, invariably departs from this end, usually in the form of a thin cone which gradually attenuates until it becomes the axis cylinder. On its way toward the white medullated matter the axon gives off a number of side branches or collaterals. These invariably return toward the surface of the brain, and after a number of subdivisions, end in the bulbar apparatus before described, and serve the purpose of connecting one cortical psychical neuron with a large number of others situated in its immediate neighborhood.

Thus it is found that the cortical neurons not only receive impressions from more distant sources, intrinsic or extrinsic to the brain, but that one cell receiving the dynamic force may communicate it to dozens of other cells, and that a considerable excitation of numerous neurons may result from what was in the first place an excitation of inconsiderable moment, for in fact the whole mass of cells in the cortex of the brain are so intricately united one with another by the complicated arrangement of fibres and collaterals that the brain-rind may be considered as an unit, at least such is the present idea derived from a study of its minute anatomy by the silver methods now in vogue.

We have seen the form and connections of the psychical cell in health, let us turn for a moment and see its deportment under certain pathological conditions.

I have studied during the past few months the effects of the action of certain poisons upon the cortical cell, notably the effects of alcohol, of the poison derived from the castor-oil bean, ricin; and for the toxins of bacterial source that developed in experimental hydrophobia. All possess the quality of destroying the protoplasm of the nerve cell and annulling its functions, some with extreme rapidity, some more slowly. All act upon the living substance of the cell in a similar manner, the process being one of a peculiar type of parenchymatous degeneration.

In the earliest stages of the degenerative process, or where the amount of the poison circulating through the blood-channels is but small in amount, we find the changes confined to the fine free extremities of the dendrons, principally in the outermost layer of the cortex, where the branches of the psychical cells have their endings. On these fine branches, in the place of the smooth rounded contours of the stems, one finds they

have acquired a number of knots or tumefactions in their course, and over the site of these swellings the round-headed gemmules are beginning to show signs of disease. They no longer assume the full black staining from the silver, but appear light-colored, and besides are, owing to the swelling of the stems, pushed further apart than is natural.

A stage further in the process shows an increase in the number of the tumefactions. They also extend further downward on the stems. The gemmules are now beginning to drop off from the branches, are being taken up by the lymphatics, and rapidly disappear. Soon the finer branches begin to atrophy and disintegrate, they dwindle and drop off from the thicker stems, or are reduced greatly in length, and the portions remaining are thickly set with swellings of smaller or larger size, from which the gemmules have almost entirely disappeared.

As the irritation of the protoplasm of the nerve cell continues, the destruction becomes more and more intense, the long apical and basal branches are reduced to knotted stumps, scarcely retaining anything of their former aspect; eventually the remaining portions of the neuron, now reduced to the corpus and axon, become involved in the retrogressive process; the body also begins to break up, but as it is extremely resistant to the effects of the toxin, it is a long time before actual disintegration takes place and it is removed by the lymph currents.

The axis cylinder seems to be the most resistant portion of the cell to the destructive influences of irritant poisons; long after the other portions of the neuron have attained a considerable degree of degeneration, it retains its fine rounded thread unswollen, and apparently uninfluenced by the morbid process going on in the other members. The collaterals and terminal apparatus retain their normal form until the destruction of the cell has been completed. The only disease in which there is an exception to the rule of the continuance of the axon is in hydrophobia, where a few cylinders may now and then be seen to have spindle-like thickenings in their course.

Synchronous with the degeneration of the protoplasmic twigs of the neuron, interesting changes take place in the nucleus. The nucleolus, as well as the coarser molecular particles contained in the nuclear ring, swell and form rounded or irregular corpuscular bodies that occupy a large portion of the circle. The nuclear substance also shows altered properties, it absorbs more of the aniline dye, and no longer shows the usual disposition of the molecular particles found in health. Even in the second stage of the degeneration, when the cellular branches are tumefied and the gemmulæ are dying, the cells are practically incapable of functioning, for their connection with other neighboring or more distant neurons is already broken, and they can no longer receive the nervous impressions transmitted from other elements, and any impulses originating within their corpora must be perverted ones, and more likely to be the source of irregular muscular contractions than of perfectly coordinated movements; in fact we do find these very incoordinate motions in many cases of severe poisoning with toxins, especially those of bacterial source.

In the tumefactions of the dendrites of the nerve bodies and loss of the gemmulæ, the connecting link between the

terminal fibre apparatus and nerve cell is broken, and one can readily see in the loss of the anatomical relations an explanation of the numerous dementias and mental obtundities that follow a not inconsiderable proportion of cases of infectious fevers.

The pathology of a number of chronic insanities seems to depend largely on the condition of the protoplasmic branches of the nerve cells and of their adherent gemmules. In vari-ous forms of dementia there is a distinct diminution in the numbers of these little appendages to the neuron, together with reduction of the calibre of the stems. In some cases of idiocy I have found a pronounced lack of development of the gemmules, and accordingly deficiency in the number of points on which external impressions may be received by the central cell, hence the mental slowness and obtundity.

THE FREQUENCY OF CONTRACTED PELVES IN BALTIMORE.[*]

By J. Whitridge Williams, *Associate Professor of Obstetrics, Johns Hopkins University.*

Five years ago I wrote a short article, entitled Pelvimetry for the General Practitioner,[27] in which I endeavored to show that pelvic mensuration was grossly neglected in this country and that our obstetrics suffered severely in consequence.

At the present time, I am glad to say, far more attention is being paid to it, and students generally are taught that it should constitute an important part in the examination of the pregnant and parturient woman.

In the article referred to, after discussing various aspects of the subject and urging that pelvimetry be made an integral part of the first obstetric examination, I stated : "Any one, who will regularly pursue this course, will be amazed to find how many moderately contracted pelves do exist, and will then be able to explain, in a rational way, many difficult cases of transverse or other presentations, which previously he merely turned or delivered by forceps or cranioclast, and whose abnormal presentation or mechanism he ascribed to some freak of nature rather than to a rational and sufficient cause."

Since the opening of the Out-door Obstetrical Department of the Johns Hopkins Hospital, a little more than a year ago, external and internal mensuration of the pelvis has been made an integral part of the examination of every pregnant or parturient woman who applies for aid, and the results have amply substantiated the prediction just quoted.

Up to March 15, 1896, we have collected the measurements of one hundred women, nearly all of whom were examined several times during the course of pregnancy, while a few were examined only at the time of labor. It is to the results of these observations that I desire to direct your attention.

I might say, in passing, that all the women were examined by Dr. Geo. W. Dobbin, the Assistant Resident Obstetrician of the Hospital, but in almost every case mentioned in this article the examination was also controlled by me, so that there is no reason to attribute any of the cases to faulty pelvimetry.

The study of pelvic contraction is of comparatively recent date. Until the sixteenth century, absolutely nothing was known concerning it ; it being supposed that the pelvic bones separated during labor, and that any obstacle to the birth of the child was due to resistance offered by the soft parts.

As the first accurate description of the pelvis was given by Vesalius (1514–1564), any idea as to abnormal pelves was impossible before that period. And it was not until after his death that one of his pupils, Julius Caesar Arantius' (1530–1589), described the first recognized case of contracted pelvis. The teachings of Arantius, however, exerted but little influ-ence, and the earlier uncertainty concerning the normal anatomy of the pelvis continued for many years, and naturally the doctrine of contracted pelvis remained undeveloped.

It appears from a careful perusal of the works of the great Mauriceau[15] that he recognized contracted pelves in only two cases ; one of them being the case upon which Hugh Cham-berlen attempted to illustrate the advantages of the forceps invented by his uncle, and so ignominiously failed.

It was not until the first part of the eighteenth century that the doctrine of contracted pelvis began to exert any influ-ence upon obstetrical practice, when Heinrich van Deventer,[5] in his "New Light for Midwives," described the flat and gener-ally contracted pelves, and demonstrated their effect upon the course of labor. Since then the doctrine of contracted pelvis has never been lost sight of, and nearly all the greatest names in obstetrics are associated with its rise and development.

The great Smellie[24] played an important part in this regard, and his teachings exerted great influence. It is only necessary to recall the fact that he originated the method of manual mensuration of the diagonal conjugate, and the estimation from it of the length of the conjugata vera, to appreciate the extent of his services.

Baudelocque,[2] in the latter part of the same century, devoted a great deal of attention to the subject, and it is to him that we are indebted for the first pelvimeter and our knowledge of the importance of the external pelvic measurements.

Stein[25] was the German who played an important part in developing the subject, and in impressing its importance upon his fellow-countrymen.

Since the introduction of pelvimetry and more accurate knowledge concerning pelvic deformity by Deventer, de la Motte, Smellie, Baudelocque, Stein and others, its importance has steadily increased, and the methods of pelvimetry and our knowledge of contracted pelvis have gradually improved.

To mention in detail the progress in this line would be almost equivalent to writing the history of obstetrics for the past one hundred and fifty years, and we shall therefore only refer to the work of Michaelis[16] and Litzmann,[11,12,13] and then turn from the historical side of the subject. For it is to these two men that we are indebted for perfecting our knowledge upon these lines and making possible the brilliant operative results, of which we are so justly proud.

[*] Read before the Medical and Chirurgical Faculty of Maryland, May, 1896.

Michealis was professor of obstetrics in Kiel from 1843 to 1850, and during those seven years accurately measured the pelvis in one thousand consecutive cases, and found that 72 of them were contracted to 8.75 cm. (3.5 inches) or less in the conjugata vera. This was the first accurate statistical knowledge on the subject, and his results are as valuable to-day as when his book, " Das enge Becken," first appeared in 1851.

Litzmann[11] succeeded Michealis at Kiel and continued the same line of work and soon collected another thousand cases with accurate pelvic measurements, which with Michealis' cases form the basis of our knowledge concerning the frequency of contracted pelvis.

Up to the time of Michealis, the conception as to what constituted a contracted pelvis varied greatly. Many authors considered a pelvis contracted only when it offered an absolute bony obstacle to labor; while others considered the slightest deviation from the normal standard sufficient to justify the employment of the term. Michealis[15] was the first to suggest a rational terminology, and stated that we should designate as contracted not only those pelves which directly interfere with the birth of the child by direct mechanical obstruction, but any pelvis which is contracted sufficiently to alter the normal mechanism of labor; all pelves having a conjugata vera of 8.75 cm. (3.5 inches) or less being designated as contracted.

And Litzmann[12] stated : " According to my conception, we must consider the border-line, from which contraction of the pelvis from an obstetrical standpoint begins, as such a degree of shortening of one or more diameters, as under ordinary circumstances (medium size and resistance of child) will exert a direct mechanical, but not necessarily retarding influence upon the course of labor."

He placed the border-line at 9.5 cm. (3.8 inches) for flattened and 10 cm. (4 inches) for generally contracted pelves, and accordingly found that 14 per cent. of his cases were contracted. Had the same limits been placed upon Michealis' cases he would have observed 13.1 per cent. of contracted pelves in his series, instead of 7.2 per cent., as he stated.

The limits suggested by Litzmann have been generally adopted, and we usually designate as contracted, flat pelves having a conjugata vera of less than 9.5 cm. (3.8 inches), while in generally contracted pelves the limit is placed at 10 cm. (4 inches).

Since the appearance of the statistics of these two observers, many of the German obstetricians have studied their cases in the same manner; and we shall now adduce some of their statistics to illustrate the frequency of contracted pelvis in Germany and its variations in the various clinics. Thus:

Leopold,[7] in Dresden, 1892–93 (Franke) in 2512 cases, found 24.3 per cent. contracted pelves.

Schwartz,[23] in Göttingen, 1862–65, in 463 cases, found 22 per cent. contracted pelves.

Schwartz, in Marburg, 1859–62, in 501 cases, found 20.3 per cent. contracted pelves.

Weidenmüller,[26] in Marburg, 1885–95, in 3214 cases, found 18.1 per cent. contracted pelves.

Fischl,[6] in Prag, 1882, in ——— cases, found 16 per cent. contracted pelves.

Müller,[17] in Berne, 1880, in 1177 cases, found 16 per cent. contracted pelves.

Litzmann,[11] in Kiel, 1850–57, in 1000 cases, found 14.9 per cent. contracted pelves.

Michealis,[16] in Kiel, 1843–50, in 1000 cases, found 13.1 per cent. contracted pelves.

Köttgen,[10] in Bonn, 1895, in 2000 cases, found 13.45 per cent. contracted pelves.

Pfund,[18] in Munich (Winckel), 1885, in 1199 cases, found 9.5 per cent. contracted pelves.

Schatz,[21] in Rostock, 1895, in ——— cases, found 9 per cent. contracted pelves.

Gönner,[9] in Basel, 1882, in ——— cases, found 7.9 per cent. contracted pelves.

It accordingly appears that from 8 to 24 per cent. of all the women entering the German clinics present more or less pelvic contraction. In other words, every twelfth to every fourth woman has a contracted pelvis.

It is possible that Leopold's[7] figures may be somewhat too high, as they are based in great part upon external measurements alone, and accordingly are not of as great value, as if based upon the results of both external and internal mensuration.

Winckel[24] states that it is safe to say that from 10 to 15 per cent. of the women in Germany present some pelvic contraction, but that only about 5 per cent. are sufficiently contracted to give rise to difficult labors; while Schauta[22] considers that we may assume that every seventh woman will present more or less contraction.

I have been unable to find accurate French statistics to compare with the German, but note that Pinard,[19] in a recent article on symphysiotomy, states that he observed 107 contracted pelves in his clinic during the year 1895, and as he has a material of about 2000 cases a year, this would correspond to a frequency of about 5 per cent. Out of these 107 cases he performed twenty symphysiotomies, which clearly shows that many of them were seriously contracted.

The statistics just adduced give some idea as to the frequency of contracted pelves in Germany and France, and it now remains to consider their frequency in this country.

It is generally believed that contracted pelves are of very rare occurrence in this country, and a casual review of the American text-books would serve to confirm this belief.

Dewees,[4] in his Compendious System of Midwifery, stated that in all his experience he is doubtful if he had met with three cases of contracted pelvis; and this statement concerning their frequency has been very generally accepted and handed down to the present time.

Lusk,[14] in the latest edition of his work, states that all varieties of pelvic deformity may be observed among our foreign-born population, but considers that contracted pelves exist but rarely in our native-born women.

This appears to be the general opinion, and in a communication before the New York Obstetrical Society, Fruitnight[8] stated that he had observed only 2 contracted pelves in 1000 labor cases.

All the evidence which has been adduced in support of the rarity of pelvic deformity in this country has been of a very

general character, and I am acquainted with only one author, Reynolds,[20] who has attempted to study the question from a statistical standpoint. In 1890 he read a paper before the American Gynæcological Society[20] on this subject, and stated that he had observed only 30 contracted pelves in 2227 labor cases which had come under his control in Boston. This would represent a frequency of 1.34 per cent.

He designated as contracted all pelves having a conjugata vera of 8.75 cm. (3.5 in.) or less, when flattened, or 10 cm. (4 ins.) when generally contracted, and stated that they nearly all occurred in foreign-born women, only three or four of the cases occurring in native-born Americans.

From his own confession, it appears that he only measured the pelvis when some obstacle to labor arose which required operative interference, and it is evident that a large proportion of cases thereby escaped observation, as it is well known that the great majority of women with contracted pelves have spontaneous, if slow, labors.

I agree entirely with Winckel,[25] who says "the publication of Reynolds unfortunately fails to prove anything, because only those cases were measured in which operative interference was necessary. It therefore cannot be claimed that his material was thoroughly worked up," etc. And "so long as it is not demonstrated that rachitis, for example, occurs far more rarely on that side of the ocean than with us, so long as thousands and thousands of pelvic measurements are not adduced, so long will all such statements rest upon a very uncertain foundation."

It is evident that Winckel[25] has struck the keynote, and not until we are in a position to present series of pelvic measurements from thousands of consecutive labor cases shall we be able to prove or disprove the general statements of the text-books.

There is, however, absolutely no doubt to my mind that they occur far more frequently than is generally supposed.

How many of the men here present have not performed craniotomy after fruitless attempts at forceps or version? How many cases of vesico-vaginal fistula have you observed? No doubt, the vast majority of such cases were due to contracted pelvis.

According to the statistics of Zinke,[29] 213 symphysiotomies were performed throughout the world between 1892 and 1894, and of these, 24, or 11 per cent. were done in the United States. All these operations were rendered necessary by pelvic contraction. And does it not appear strange, if they are of so infrequent occurrence as is generally stated, that we should have performed one-ninth of the symphysiotomies of the world; while the European countries, with their large preponderance of contracted pelves, should have to divide the other eight-ninths among themselves?

It is readily understood, in the absence of routine pelvimetry, how a very large proportion of the moderate degrees of pelvic contraction are overlooked, when we consider the relation which the German statistics show to exist between the number of operative and spontaneous labors occurring in these cases. Thus, Michealis[15] showed that 71 per cent. of his cases ended spontaneously, Leopold[7] 69.5 per cent., Gönner[9] 54 per cent., and Pinard[19] 72 per cent. In other words, from one-half to three-fourths of the moderate degrees of pelvic contraction would pass unnoticed, if the pelvis were not measured, unless the obstetrician observed his cases far more accurately than is usually the case.

An article on the frequency of contracted pelvis is hardly the place to point out the effect of the pelvic deformity upon the presentation and position of the child, upon the mechanism of labor or its duration, or upon the prognosis for the mother or child, and we shall, accordingly, pass over this part of the subject, and simply state that a careful examination of the pelvis would reveal in many instances the cause of many abnormal presentations and of many a tedious and difficult spontaneous labor, not to speak of the operative cases.

We now turn from the work of others to our own observations. The routine examination of the pelvis in one hundred consecutive cases has shown us that fifteen of them were abnormal.

In our one hundred cases, we have found one-half as many contracted pelves as did Reynolds[30] in 2227 cases. This is certainly a remarkable showing; and, while I wish it distinctly understood that I consider that we are dealing with too small a number of cases to be justified in basing statistical conclusions upon them, at the same time it serves to prove that Reynolds has overlooked a large number of cases by the omission of routine pelvimetry, and that contracted pelves are far more frequent with us than is generally supposed, and the reason that they are not discovered more frequently is that they are not looked for.

I have designated as contracted only those pelves which presented an oblique conjugata of 11 cm. (4.4 in.) or less, and which correspond to a conjugata vera estimated at 9 cm. or less (3.6 in.)—in other words, only pelves whose conjugata vera is shortened 2 cm. (0.8 in.) or more. In two instances I have departed from this rule and have considered as contracted one pelvis having a conjugata vera of 9.75 cm. (3.9 in.), and another of 9.5 cm. (3.8 in.), for the reason that they both gave rise to difficult labors, necessitating in the one case a difficult breech extraction, and in the other the application of high forceps.

When we analyze our cases according to the variety of deformity presented, we find that we have to deal with:

four rachitic flat pelves,

four simple flat pelves,

five generally contracted pelves,

one coxalgic oblique pelvis,

one transversely contracted pelvis of a male type.

It is usually stated by most American authors that the great majority of contracted pelves, which are observed in hospital practice, occur in foreign-born women, while only a small proportion are observed in the native-born.

When we consider our material from this point of view, we find that seven cases occurred in negresses and eight cases in white women.

Of the eight white women, four were native-born, two were German, one Bohemian and one Irish. These figures certainly do not bear out this statement, as they clearly show that eleven of our fifteen cases occurred in native-born Americans.

It is also of interest to consider how the several varieties of deformity are divided among the various nationalities.

We find that our seven blacks presented three generally contracted pelves, two rachitic and two simple flat pelves.

Of our four native-born whites, two presented simple flat pelves, one a flat rachitic and one a coxalgic oblique pelvis.

One of the two Germans presented a generally contracted pelvis, and the other a transversely contracted pelvis which conformed to the male type.

The Bohemian had a generally contracted, and the Irish woman a flat rachitic pelvis.

No doubt, to most of you, the data just adduced possess only a purely scientific interest, and we shall therefore turn to the more practical consideration of the effect of the contracted pelvis upon the course of labor.

Two of the pelves considered in this paper belong to women who have not yet been confined, but it may be of interest to consider the history of their past labors. The first case is a colored secundigravida, with a generally contracted pelvis, whose previous labor was very slow and was terminated by the forceps delivery of a dead child. And the other case is a German who has had two children. She has a transversely contracted pelvis of the male type, very deep, with a very high symphysis pubis, lateral contraction of the pelvic outlet, the distance between the ischial tuberosities being about 8 cm., and the conjugata vera 8.5 cm. (3.4 in.), both her previous labors having been terminated by craniotomy.

It is apparent that the pelvic contraction in these two cases is quite marked, and played an important part in the production of the fœtal mortality in the previous labors.

Of the thirteen cases which have already been delivered, seven were delivered spontaneously, while six necessitated operative interference.

Five of the seven spontaneous cases were delivered at full term of live children. The sixth spontaneous case was a syphilitic colored primipara, with a flat rachitic pelvis, conjugata vera 8 cm. (3.2 in.), who was delivered at the eighth month of a macerated syphilitic fœtus ; while the seventh case resulted in an abortion at the sixth month. This was an Irish woman, pregnant for the third time. Both her previous labors had resulted in dead children after tedious forceps operations, the last delivery resulting in a complete perineal tear and a large vesico-vaginal fistula, which were repaired at the Johns Hopkins Hospital. This case was spontaneous only because of the abortion, and the probabilities are, had she gone on to full term, that she would have required a symphysiotomy.

The six cases which required operative interference were delivered as follows :

four by high forceps,
one by craniotomy on dead child, and
one by a difficult breech extraction.

No one can hear these somewhat dry statistical statements without being convinced of the very important part played by the pelvic deformity in the cases before us.

It is evident that the deformity alone, or the abnormalities in the mechanism of labor produced by it, were the direct cause of the various operative procedures which we have just men-

tioned, or of the fœtal mortality in the previous labors of the women who have not yet been confined.

Who, after hearing these results, can say that the study of moderate degrees of pelvic contraction is not worthy of far more consideration and investigation than are accorded them by most of us?

I believe that I have made it evident that pelvic contraction is of far more frequent occurrence than is generally believed, and that it is the cause, directly or indirectly, of a large proportion of the obstetrical operations which we are called upon to perform.

Does it not then behoove us to be on the lookout for it, and prepared to recognize it before the onset of labor, so that we may be prepared in advance for the eventual forceps or version, and in rare cases for the more serious operations of symphysiotomy and Caesarian section ?

This necessitates the careful and routine examination of every pregnant woman before the onset of labor, when we should map out the presentation and position of the fœtus and carefully study the form and size of the pelvis.

It is not until this is done that we are doing anything like our full duty by our patients, and if I have succeeded in impressing the importance of the systematic examination of pregnant women, including pelvimetry, upon a single man here, I shall feel amply repaid for the preparation of this paper.

Dohrn[5] stated some years ago, "that the physician who does not measure the pelvis is comparable to one who diagnoses heart and lung troubles without the aid of auscultation and percussion"; and I can only indorse his statement. At the same time I do not wish to be understood as advocating pelvimetry as the *summum bonum* of obstetrics. I have just shown you its importance, but unfortunately its practical teachings are not absolute.

The birth of the child is dependent not only on the size of the pelvis, which we can determine with reasonable accuracy, but also upon the size of the child's head, its compressibility and adaptability, and the character of the labor pains, which unfortunately we can only approximate, but never determine absolutely in the concrete case.

Therefore, in moderate degrees of pelvic contraction, pelvimetry does not give all the information we desire. And with pelves of the same size, we sometimes find that one patient is delivered spontaneously, while with the next we are obliged to resort to operative interference.

These considerations, however, do not absolve us from the necessity of pelvic mensuration ; they only teach us its limitations and enable us to comprehend the more fully the many factors which should be considered by the conscientious accoucheur.

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HOSPITAL PLANS.

SPECIAL COURSES FOR GRADUATES IN MEDICINE GIVEN BY THE JOHNS HOPKINS UNIVERSITY AND HOSPITAL. CHANGE OF DATE.

With the completion of the organization of the Johns Hopkins Medical School, it has been found necessary to give the *courses intended especially for physicians* hereafter during the months of May and June, instead of at an earlier period of the academic year as heretofore. This new arrangement applies to the academic year beginning October, 1896. The courses of instruction for the undergraduates who are candidates for the degree of Doctor of Medicine are open only to these undergraduates. Physicians, not candidates for a degree, are admitted only to the special courses which begin May 1, 1897, and which continue for two months. Those who have had the requisite training and desire to undertake advanced and research work in the various laboratories, may be admitted at any time during the academic year, at the discretion of those in charge of these laboratories.

It is believed that the new arrangement as to the time of holding the graduate courses will prove to be more convenient than the former one to the majority of those desiring to take the courses.

These courses are intended especially to meet the requirements of practitioners of medicine. They include laboratory courses in pathology, bacteriology and clinical microscopy, and practical instruction in the hospital and in the dispensary in medicine, surgery, gynecology and the various special departments of practical medicine and surgery.

The detailed statements concerning these courses, the fees and all other necessary information, will be found in the published Announcement of the Special Courses for Graduates in Medicine, which will be sent upon application to the Johns Hopkins Medical School, Baltimore.

NOTES ON NEW BOOKS.

Text-Book of General Pathology and Pathological Anatomy. By RICHARD THOMA, Professor of General Pathology and Pathological Anatomy in the University of Dorpat. Translated by ALEXANDER BRUCE, M. A., M. D., F. R. C. P. E., F. R. C. S. E. ; Lecturer on Pathology, Surgeons' Hall, Edinburgh, etc. Volume I, with 436 Illustrations. (*London : Adam and Charles Black*, 1896.)

This translation of Thoma's Lehrbuch der allgemeinen pathologischen Anatomie, which appeared in the original in 1894, is a welcome addition to the rather meagre list of pathological text-books in the English language. This first volume treats of general pathological anatomy and general pathology, the part relating to special pathological anatomy not having yet appeared in German.

Section I of the book is devoted to general etiology and is taken up mainly with the description of pathogenic micro-organisms and entozoa. Upon the whole this section is less satisfactory than the remaining parts of the book, as indeed is now-a-days usually the case in text-books on General Pathology. The student cannot dispense with works devoted especially to the description of pathogenic micro-organisms and other parasites.

The heading of Section II is "Elementary Forms of Disease." This section is occupied with the consideration of "Disturbances of the Circulation of the Blood" and the "Disturbances of Tissue Nutrition." The treatment of the subject of the circulatory disturbances constitutes the most original and valuable part of the work. It is especially in this field of pathology that Thoma has labored for many years with brilliant success, during the period both of his assistantship to Prof. Arnold in Heidelberg and of his professorship in Dorpat. His presentation of the subject of the general and local disturbances of the circulation is an admirably

FIG. 12. NORTHWEST CORNER OF THE STUDY ROOM ON THE THIRD FLOOR.

The case shown contains the wax models made by Ziegler. The main part of the room is devoted to the study of models and finished dissections.

clear and important contribution, and can be confidently recommended to students of pathology as worthy of careful reading. It is based throughout upon a large amount of original investigation, characterized, as is so much of Thoma's original work, by ingenious experimentation and by the effort to attain mathematical accuracy and to find mechanical explanations of pathological phenomena. Thoma's highly important researches on angio-sclerosis are considered in this section only in part. It is much to be desired that the volume to be devoted to special pathological anatomy may appear before long, for this will contain doubtless a compendious and authoritative presentation of his studies on angio-sclerosis, now widely scattered and difficult for the ordinary reader to grasp in their entirety.

The third and final section of the book is entitled "Combined Forms of Disease," and is devoted mainly to tumors. The concluding chapter on General Diseases contains a condensed and inadequate consideration of the general pathology of fever. In the first chapter of this final section Thoma presents his well-known views advocating the abandonment of the term "inflammation." All of circulatory and exudative phenomena of inflammation are treated in this work, not under the general heading of inflammation, but under the "Local Circulatory Disturbances," being resolved into their components, such as Hyperæmia, Stasis, Diapedesis, Emigration, Exudation. So far as inflammation is to be considered as a circulatory disturbance characterized by exudation, it is entirely practicable to treat it in the manner adopted by Thoma, although not without loss of comprehensiveness and of perspective. But inflammation cannot be resolved wholly into a circulatory disturbance with exudation, and it is interesting to consider how the author of a textbook on pathology who proposes to discard the word "inflammation" would attempt to deal with the entire group of phenomena, including regressive and progressive changes of tissue, which are usually embraced under the conception of inflammation. Thoma himself, after setting forth his various objections to the perpetuation of the word inflammation, evidently finds it impracticable to get along without it. Besides the simple circulatory disturbances and the simple nutritive disturbances and tumors, there remain what Thoma describes as "combined pathological conditions of the organs which have been almost without exception described as inflammations." These conditions must be described as a whole, and some name is needed to designate the group of elementary pathological changes which are comprised in "these combined pathological conditions." We have no name, and Thoma suggests none other than inflammation for these "combined pathological conditions," nor is a better one likely to be found and to gain currency.

The work of the translator is in general good. Occasionally, however, the sense of the original has been lost, as on page 351 where the translation reads "deficiency of albumen and the pronounced watery condition of the blood cannot be regarded as the cause of the œdema, if this change also diminishes the amount of albumen in the fluid of œdemas which are due to other causes." This apparently incomprehensible statement becomes clear when it is found that the author said, "although this change diminishes the amount of albumen," etc. And in the sentence following the preceding one, the sense of the original is not accurately preserved in the translation which reads, "The so-called hydræmic œdema appears as the result of disease of the capillary walls which increases their permeability, and is itself associated with angio-sclerosis." The last part of the sentence is in the original, "in Beziehung steht zu der Angiosklerose." These failures to present the exact sense of the original happen to occur in particularly important and italicized sentences giving Thoma's conclusions as to the cause of so-called hydræmic œdema.

The publishers' work deserves only commendation. The clear typography, the reproductions of the usually excellent figures and the general appearance of the book are admirable.   W. H. W.

Atlas of Nerve Cells. By M. Allen Starr, M. D., Ph. D., with the co-operation of Oliver S Strong, A. M., Ph D., and Edward Leaming. M. D., F. R. P. S. Pp. 1–78, with fifty-three plates and thirteen diagrams. (New York and London : Published for the Columbia Univ. Press, by Macmillan & Co., 1896.)

The atlas consists of a series of artotype reproductions of photographs made by Dr. Leaming from tissues stained (in the main by Golgi's method) and sectioned by Dr. Strong, together with a descriptive text by Dr Allen Starr, in which many of the essential facts which are at present known concerning the distribution and interrelations of the neurons within the central nervous systems have been included.

In the introductory note upon the Golgi method, Dr. Strong describes in some detail the various modifications which he has employed, referring especially to (1) a "lithium bichromate method" by means of which he gets quickly results equal to those obtainable by the long method, and (2), a formaline-bichromate method which is even more certain, and which he has found of especial value in the study of the adult brain.

The photographic technique is discussed in a section by Dr. Leaming, in which there will be found some notes of interest to those engaged in photomicrography regarding (1) a modification of the tropæolin screen, and (2) a method of obviating diffraction spectra and halation.

Dr. Starr states in the beginning that he has "not attempted to write an exhaustive account of nerve histology, but rather to present a brief review of the essential facts which can be demonstrated by the aid of the Golgi stain, and to show how these facts aid in the knowledge of nervous action."

As regards the structure of the spinal cord, cerebellum, and cerebral cortex, the researches of Golgi, Cajal, van Gehuchten, His, Retzius, v. Kölliker, v. Lenhossek, Berkeley and others have been freely used, and a clear epitome is given. The medulla and pons have not been extensively treated. It is pleasing to note that the relations of the superior colliculi of the corpora quadrigemina to the optic nerves, and of the inferior colliculi to the cochlear nerves, have been emphasized. We should have been glad to find the central relations of the cochlear and vestibular nerves dealt with rather more in detail, now that this has been rendered possible through the brilliant researches of Held of Leipzig.

Concerning the nuclei in the thalamus and their connections, the results of von Monakow's work (published at length in the Archiv f. Psychiatrie) have been briefly abstracted and incorporated. Dr. Starr further describes in connection with the thalamus (p. 53) certain cells which are especially characteristic of the median and lateral nuclei, to which he gives the name "stellate cells of the thalamus." He speaks too of some cells hitherto undescribed, which he believes to be peculiar to the ventral nucleus of the thalamus (vide Pl. xxviii). The text includes also notes on some original studies of the nucleus caudatus and nucleus lentiformis.

In view of the recent work of Flechsig (cf. Neurol. Centralbl., 1896, No. 1), Fig. 12, p. 73, is perhaps open to objection, but all must feel grateful to find reproduced in the atlas the beautiful plates of the cortex taken from the "Studien" of the late celebrated Swedish investigator, Hammarberg. His studies of the cellular structure of the cerebral cortex are by far the most exact which up to the present time have been undertaken, and it gives me ... a ... and appreciated as they deserve to be.

The press-work has been excellently done, and the reproductions of the photographs are ... The ... character, that showing the spinal ganglion (p. ...) illustrating Purkinje cells are particularly beautiful.

It is the intention of the author at some future time to issue another volume, in which there will be illustrated the peripheral nerves and their endings, together with the organs of sense.

L. F. B.

Text-Book upon the Pathogenic Bacteria. By JOSEPH MCFARLAND, M. D. (W. B. Saunders, Philadelphia, 1896.)

Dr. McFarland's book opens with an introductory chapter which discusses principally the controversies which were waged upon the subject of spontaneous generation, and ends with a list of the principal pathogenic organisms discovered from 1879 to the present time.

Chapters one and two deal with the morphology and biology of bacteria, the classification of Cohn is cited as the most scientific one, and the various points bearing on the growth and development of bacteria are fully discussed. In chapter one it is twice stated that the bacillus coli communis is a non-motile organism, a statement we think which is hardly borne out by the work of recent investigators, particularly that of Theobald Smith. In chapter two the statement that most species of bacteria are not affected in their growth by the presence or absence of light is contrary to the teachings of most bacteriologists.

Chapter three deals with immunity and susceptibility; it covers this difficult ground as well as could be expected in such a short space.

Chapters four to nine deal with technique, the proceedings recommended being similar to those ordinarily in use in all laboratories.

The examination of water, soil, and air is taken up in a brief manner in the three following chapters.

The second part of the book deals with specific diseases and their bacterial causes. It opens with a chapter on suppuration, in which the ordinary pus-producing organisms are described. We cannot agree with the statement that the staphylococcus pyogenes aureus shows its most characteristic growth upon agar, as oftentimes the color is almost entirely lacking on this medium, whilst on the other hand the growth on potato rarely fails to show pigment from the very outset. The statement that the streptococcus does not grow on potato is evidently meant to imply that it has no visible growth. The statement that the bacillus pyocyaneus is probably "a harmless saprophyte" does not accord with the work of Gessard, Chasrin and others who have implicated this organism in a definite form of intestinal infection, the so-called "maladie pyocyanique."

The chapters on tuberculosis, leprosy and the other chronic infectious diseases are short and concise.

The chapter on diphtheria is a fairly satisfactory review of the subject, though most bacteriologists probably regard the pseudo-diphtheria bacillus as a separate organism, and not as an attenuated diphtheria bacillus, as the author states it to be.

Tetanus, rabies and symptomatic anthrax are treated of briefly and satisfactorily; it is to be noticed in the chapter on the last-named subject that the proteus vulgaris is spoken of as a harmless saprophyte, an opinion quite commonly held, but which is disproved by the association of this organism with Weil's disease, pleurisy, peritonitis, etc.

Typhoid fever is satisfactorily treated of, though the statement that the typhoid bacillus slightly acidifies litmus milk is too sweeping, as the acidification is in many instances followed by a marked alkalinization.

The cholera group is taken up satisfactorily in chapters six and seven.

In the chapter on pneumonia the statement is twice made that the diplococcus pneumoniæ will not grow on potato, when, as a matter of fact, it does grow on this medium, though the growth is often invisible. The statement that the diplococcus pneumoniæ, which is normally present in the mouth in a certain percentage of cases, can be drawn into the bronchioles by a deep inspiration is a rather startling one. In the first place, currents of air do not detach bacteria from moist surfaces, and in the second, the inspired air does not reach the terminal bronchioles.

The remainder of the book takes up bubonic plague, measles, influenza, and a number of the infectious diseases of animals.

Barring the minor mistakes mentioned above, the book is fairly satisfactory; there are occasional typographical errors, and in places the author's language is a little obscure.

The plates are good.   G. B.

Ueber die Wirkung der Theebestandtheile auf körperliche und geistige Arbeit. By AUGUST HOCH und EMIL KRAEPELIN. Kraepelin's Pyscholog. Arbeiten, Band I, Heft 2 and 3, pages 378–488.

The results of this research are among the most interesting of recent psycho-pharmacological contributions. The investigators have undertaken an exact study of the action of the two main constituents of tea, the caffein and the ethereal oils, paying particular attention to the effects of these substances, (1) on muscular work, and (2) on the association processes concerned in adding. To determine the former, the ergograph was used, and no small part of the problem consisted in so modifying this instrument as to make it accurate enough for the research. A large number of curves showing muscle-fatigue with and without the action of the substances under examination, were obtained from the individuals submitting themselves to experiment, every precaution being taken to eliminate error from irregularities in work, rest, sleep, the taking of food, etc. The experiments were made upon Drs. Hoch, Jost, Hibbard and Reis; the majority of them in Kraepelin's laboratory in Heidelberg, a part of them in the laboratory of the McLean Hospital in Massachusetts.

The experiments made upon Dr. Hoch showed that caffein distinctly increased the capacity for muscular work, the ergograph curve proving that this increase affected mainly the amplitude of the individual movements rather than the number of them. The tea-oil, on the contrary, lessened the capacity for muscular work, but made distinctly easier the associative processes concerned in adding. The results of the experiments on Drs. Hibbard and Reis agreed in the main with those obtained with Dr. Hoch; the experiments made upon Dr. Jost differed considerably, in that larger doses of caffein were required, and besides the effects appeared later and lasted very much longer, a personal difference perhaps not so very surprising considering what is already known of the action of alcohol upon different individuals.

The mode of action of the caffein and of the oils is discussed at some length and most entertainingly. The details must be sought in the original article, but it may be interesting to state that the authors conclude that the caffein acts immediately upon the muscular tissue, permitting the increase in the amplitude of the individual movements without materially altering their number; while the tea-oil acts upon the motor centers in the nervous system, rendering difficult the setting free of motor impulses, and so affecting the number rather than the amplitude of the movements. While the caffein in tea is known to render the course of ordinary associations somewhat easier, the experiments of Hoch and Kraepelin have led them to conclude that the associative processes are also distinctly facilitated through the action of the ethereal oils, and they state that the euphoria of the tea-drinker may depend in large part upon the action of these ethereal oils upon his nerve centers.

The presence in the same crude drug of two chemical substances possessing almost diametrically opposite effects is by no means unique: a number of similar instances in pharmacology will be immediately recalled.

It is easy to see that the results of the research, aside from their high scientific value, have also an eminently practical bearing; since the quality and psychic effect of a given sample of tea will depend largely upon the relative proportions of the caffein and the ethereal oils which it contains, the qualitative determination of these may afford a new field of activity to the commercial chemist.

                                                                L. F. B.

BULLETIN

OF

THE JOHNS HOPKINS HOSPITAL.

CONTENTS.

A CASE OF COMBINED PROTOZOAN AND BACTERIAL INFECTION.

AMŒBIC DYSENTERY, MALARIA, AND MICROCOCCUS LANCEOLATUS, ACUTE FIBRINO-PURULENT PERITONITIS.

BY SIMON FLEXNER, M. D., *Associate Professor of Pathology, Johns Hopkins University ; Resident
Pathologist, Johns Hopkins Hospital.*

[*From the Pathological Laboratory of the Johns Hopkins University and Hospital.*]

The recent literature upon malarial infections in human beings contains a few instances of associated protozoan and of mixed protozoan and bacterial infections. Among the associated protozoan infections may be included cases of multiple malarial infections, in which an individual may be infected at the same time with different groups or generations of the same organisms, or of organisms of different types, and the rare co-existence of malarial and other protozoan infections, such as amœbic dysentery.* The instances of mixed protozoan and bacterial infection are more numerous and embrace the combination of pneumonia (lobar and lobular) and malaria, bronchitis and malaria, and the rarer one of typhoid fever and malaria. Respecting the cases of concurrent pneumonia and malaria, it may be said that the same bacteria as are concerned with the causation of uncomplicated cases of this disease are found in the lungs in the mixed infections. Barker has described a case of associated erysipelas

and tertian malaria in which an invasion of the blood with streptococci existed, both micro-organisms appearing there and in the internal organs in large numbers.

The present case obtains its interest in part from the unusual character of the infection, and in part from the extent, character and consequences of the intestinal lesions. Dr. Thayer has kindly supplied the following notes of the clinical history:

The patient, A. J., was a Pole about 29 years of age, from whom a satisfactory history could not be obtained. He had been living in a malarious district since March of the past year (1895), but he had been quite well until three weeks prior to his entrance, which was on October 21st. His illness began with diarrhœa, which rapidly assumed a severe character, the movements containing much blood and mucus. During these three weeks he stated that he had several times experienced slight chilly sensations and also felt feverish. On entrance to the hospital he was very anæmic, extremely sallow ; had a palpable spleen, slight fever and severe dysentery, the movements showing much blood and mucus. The dejecta contained many small amœbæ having the characteristic appearances of the amœba coli. The blood examinations showed hyaline bodies and crescentic and ovoid pigmented forms of

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* Cf. Thayer and Hewetson: The Malarial Fevers of Baltimore. Johns Hopkins Hospital Reports, 1895, vol. V. Barker : A Study of Some Fatal Cases of Malaria, *idem*, alludes to a case of combined malaria and amœbic dysentery occurring in the hospital.

the malarial parasite. Under the administration of five grain doses of quinine every three hours the temperature fell. The diarrhœa was treated with irrigations of quinine ($\frac{1}{1500}$) repeated twice daily, but without apparent effect. The patient continued to lose blood per rectum and died on the 2nd of November.

The *autopsy* was performed 7 hours post mortem. Body of a moderately strongly built, much emaciated man. The surface presented a distinctly sallow hue. The mucous membranes of the mouth and conjunctivæ were extremely pale. The abdomen was moderately distended; the subcutaneous fat almost absent; the muscles dark-brownish red in color.

The peritoneal cavity. The omentum was well spread out, covering the intestines, but it presented an opaque appearance and was covered with a sticky exudate. The loops of the moderately distended small intestine were glued together by a similar sticky exudate. The serous membrane itself was in places vividly injected. In the fossæ small accumulations of fluid containing flakes of fibrin were encountered. The omentum was adherent along its lower border to the much enlarged and inflamed appendix vermiformis. The appendix lay anterior to the cæcum and between it and the anterior abdominal wall; it was provided with a mesentery which reached within 3 cm. of its tip, and at the termination of this the appendix was bent sharply upon itself, giving rise to a right angle. The distal 3 cm. of appendix was the least dilated part; the remainder had the thickness of the index finger and presented in addition three bulbous enlargements, which on section were found to correspond to areas of necrotic tissue. The whole was embedded in a sticky, opaque exudate.

Intestines. The large intestines were greatly distended. The sigmoid flexure was of rigid consistence and projected beyond the pelvic brim. Within this portion for a distance of 2x5 cm. the serous coat was infiltrated with blood and presented a necrotic appearance. On opening the large intestine the entire mucous membrane was found in a frayed and sloughing condition, opaque, everywhere infiltrated with gelatinous pus, and evidently necrotic. The necrosis seemed to extend far beyond the mucous coat and to involve the deeper layers. The walls, as a whole, were much thickened. In many places coagula of blood were discovered. Amid this general necrosis and sloughing more circumscribed ulcerations existed, some of which seemed to reach to the peritoneal coat. These in particular were surrounded by thickened and purulent margins, and at times they definitely undermined the adjacent tissues. The ulcerations and sloughing extended from the rectum to the cæcum, involving the whole of the latter, penetrating into the appendix, but ending abruptly with the ileo-cæcal valve. The small intestine was entirely free from ulceration, and it showed throughout nearly its whole extent, although most prominently upon the crests of the valvulæ conniventes, a slaty pigmentation. The duodenum was more pigmented than other parts of the small intestine.

The *spleen* was enlarged, weighed 380 grams, its capsule was wrinkled, and on section it presented a bluish black color. In consistence it was almost diffluent. The Malpighian bodies appeared enlarged, the pulp increased.

The *liver* weighed 2100 grams, its color was dark and slaty.

Small greyish white nodules could be seen on section, which varied in size from a pin point to a hemp seed. The larger ones could easily be made out to be abscesses, the contents of which were opaque, gelatinous and pus-like. The wall of the *gall bladder* was thickened and infiltrated with a similar exudate to that covering the peritoneum. The mucous membrane was, however, intact. The remainder of the organs exhibited no remarkable lesions.

Microscopical examination of the fresh specimen. Attention was first directed to the study of the exudates for amœbæ, and for this purpose pus (*a*) from the peritoneal cavity, (*b*) from the intestinal contents, (*c*) from the liver abscesses, was employed. The most painstaking search failed to reveal amœbæ in the pus from the peritoneal cavity, while on the other hand many typical living and moving amœbæ were discovered in the pus from the ulcers in the large intestine and the intestinal contents, and a smaller number in the contents of the liver abscesses.

The exclusion of amœbæ from the peritoneal exudate led next to the staining of cover-slips for bacteria. By the use of ordinary staining agents (gentian violet, methylene blue) myriads of capsulated diplococci resembling the micrococcus lanceolatus were revealed. The contents of the liver abscesses, stained in the same manner, failed to show any bacteria whatever. The microscopical examination of the abscess contents indicated that fewer pus cells and more necrotic and disintegrating liver cells composed these than in ordinary abscesses, thus recalling the fact pointed out by Councilman and Lafleur[*] in their monograph on amœbic dysentery, that true suppuration is not caused by the amœba dysenteriæ.

The source of the bacteria found in the peritoneal exudate, and which evidently were the cause of the acute peritonitis, was sought in the intestinal contents, where, as is well known, they are not infrequently contained, and from which source, as we have previously pointed out,[†] they may invade the peritoneum and set up a fatal peritonitis. The condition of the appendix vermiformis, which arrested attention from its swollen and necrotic appearance, was believed to have led to the escape of the micro-organisms in question. Upon closer examination it was found that corresponding with the dilatations previously described, the entire wall was in a necrotic condition. The ulcerations themselves reached deeply into the inner coats, but did not penetrate all the coats. The lumen of the swollen appendix was filled with yellow, gelatinous pus quite resembling that found in the peritoneal cavity itself. Cover-slip preparations showed many encapsulated diplococci, besides several kinds of bacilli. The former much predominated in numbers.

Malarial bodies were not numerous in smear preparations from the organs, although pigment was abundant. However, a few undoubted ovoid bodies were found in the smears from the spleen and bone marrow.

Cultures. Petri's plates were made from the blood in the heart, the exudates and all the organs, upon agar-agar. Those from the *heart's blood, spleen, lungs,* and *liver abscesses* showed

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[*] Johns Hopkins Hospital Reports, vol. II, 1891, p. 395.

[†] Johns Hopkins Hospital Bulletin, 1895, No. 49, p. 64.

no growth after having been kept at the temperature of the thermostat for 48 hours.

Peritoneum. The plate was crowded with colonies, apparently of two kinds, which, owing to the large numbers, probably did not reach full development. The larger colonies consisted of bacilli which were identified and shown to be the bacillus coli communis. The smaller colonies (predominating) were made up of oval diplococci which were shown (cultures and animal experiments) to be the micrococcus lanceolatus. The plate made from the *bile* contained 7, from the *liver* 30 colonies of the bacillus coli communis. The plate from the *kidney* was crowded with colonies of the colon bacillus, among which a few smaller colonies of diplococci were found, these being the micrococcus lanceolatus.

Histological examination. The microscopical examination of the hardened tissues was confirmatory only of the features of the case as already described. Nothing new was discovered. As regards the malarial pigmentation, the dark pigment was found especially in the liver and spleen (bone-marrow not studied), and in these organs in the usual situations The parasites themselves were very difficult of demonstration. The lesions in the large intestine caused by the invasion of the amœbæ were perhaps the most interesting. The necrosis, it was found, extended into, but for the most part not through the innermost muscular tunic, but it was surprising to what extent the mucous membrane might be dissected away from the submucosa without losing its vitality. Not a small part of the frayed appearance presented by the large intestine was produced by this partial dissection of the mucous coat. The bases of the ulcers proper were formed for the most part by the circular muscle, which was itself infiltrated with inflammatory products, cells, serum, fibrin. The inflammatory infiltration extended into the depths of the tissue, often to the serous coat, and spread laterally for a great distance. It seems probable that the ulcers in the appendix originally were caused by amœbæ, and that subsequently the extension of the necrosis to the serous surface was the work of the micrococcus lanceolatus.

Amœbæ apparently were abundant. But just here it is proper to state that in the hardened tissues it would be easy to be led into error in regard to the significance of many of the amœba-like cells present. From a study of the transitions of connective-tissue cells and their progeny in the chronically inflamed parts, it is quite certain that many of the bodies resembling amœbæ are swollen and degenerated (fatty or vacuolated) tissue cells. These, too, often lay in definite spaces, and they were found in the submucosa and muscle and within small veins. Without the proof supplied by the examination of the intestinal contents during life and at the autopsy, one must have remained in doubt as to the presence of amœbæ among these elements.

The kidneys showed a moderate degree of parenchymatous degeneration. In addition to this, emboli of liver cells were detected in branches of the renal vein. Similar emboli were discovered in the central veins of the liver lobules not infrequently. Lubarsch* has reviewed the literature upon the subject of "parenchymcell emboli." It appears that liver cell emboli are either of traumatic or of infectious (or due to intoxication) origin. There is no definite relation between the extent of the injury and the occurrence of such emboli. The transported liver cells, besides being found in the veins of the liver, occur in the heart, pulmonary arteries and branches of the renal and hepatic arteries. Among the infectious diseases liver cell emboli are found very often in eclampsia and chorea. In eclampsia they are found in the arteries of the lungs and brain and in the renal veins ; in chorea in the hepatic artery and branches of the portal vein (patent foramen ovale). Where hemorrhage, necrosis and softening exist, liver cell emboli are encountered. Thus they have been found in scarlet fever, in softening of hepatic gummata and in liver abscess. The transported liver cells have been followed from the hepatic veins into the coronary, renal and other arteries. Their occurrence in veins—renal and cerebral—is attributed to retrograde embolism, for which a high degree of venous stasis, such as occurs in eclampsia, has been assumed. Evidence of such stagnation is wanting in our case. On the other hand the disintegration of liver tissue, such as has been found in other cases, is supplied by the abscess formation and circumscribed necrosis in the liver. Lubarsch states that the conveyed liver cells may persist from 3 weeks to $2\frac{1}{2}$ months, but evidences of proliferation have never been observed.

Remarks by Dr. BARKER: The case is an interesting one on account of the curious combination of infections. In studying the fatal cases of malaria from Professor Osler's wards my attention was called to the fact that bacterial infections were often concurrent with malarial infections. In one instance a double protozoa infection had been noted, and since that study was made several such double protozoan infections have been observed in the hospital. This case is the first one in which we have to deal with a double protozoan infection associated with a bacterial infection.

* Fortschritte der Medizin. Band XI. 188.

NOTES ON TWO CASES OF URETERAL ABNORMALITY.

By George Blumer, M. D., *Assistant in Pathology, Johns Hopkins University.*

[*From the Pathological Laboratory of the Johns Hopkins University and Hospital.*]

The following two cases of ureteral anomaly, which have recently come under observation, seem uncommon enough to merit description. Through the kindness of Dr. Kelly we are enabled to supplement the descriptions by plates.

The clinical histories of the cases have no special bearing upon the pathological findings, with the exception of the fact that in case No. 1 an attack of acute cystitis had occurred some five years before death; the notes are therefore confined to the pathological aspects of the cases.

Case 1.—*Anatomical Diagnosis.* Diphtheritic inflammation of the bladder, left ureter, and left renal pelvis; suppurative nephritis and perinephritis of the left kidney; hydro-ureter and hydro-nephrosis of the right kidney; miliary abscesses in the right kidney; prolapse of the ureteral and bladder mucous membrane into the bladder cavity; localized fibrinous peritonitis; acute bronchitis; fatty degeneration and cloudy swelling of the liver; slight general arterio-sclerosis.

The following is the abstract from the autopsy protocol referring to the ureters and bladder:

The right ureter is dilated to the size of a lead pencil, and contains pale, cloudy urine. The walls are thin. The mucous membrane is congested. There is nowhere any constriction until the bladder is reached.

The left ureter is dilated to about the size of the normal ileum, its walls are markedly thickened, and it contains a thick greenish black purulent material with an offensive odor. The mucous membrane has a dirty, sloughy appearance and a green-black color, its surface shows numerous irregularities in the form of patches of grayish white false membrane formation, the membrane being firmly attached to the subjacent tissue.

The bladder is somewhat enlarged and contains turbid, foul-smelling urine. Its walls are greatly thickened, measuring as much as three centimeters in their thickest part. The mucous membrane is corrugated and of a greenish black color, and shows numerous areas of densely adherent grayish false membrane similar to those seen in the ureter. Projecting into the bladder from a point where the left ureteral orifice is normally present is a pyramidal sac, tense and fluctuating, and evidently containing fluid. This sac hangs free in the cavity of the bladder and reaches from its place of origin nearly to the internal urethral orifice. It is about eight centimeters in length, has a narrow neck, measuring three centimeters in diameter where it joins the bladder wall, and gradually expands as it passes out from this point, reaching its greatest diameter of nine centimeters a short distance from its free end. On its inner side, about its middle, a minute opening can be made out. This opening is circular and just about large enough to admit a pin point; it is situated in the center of a small area of dense fibrous tissue, and is evidently the lower opening of the left ureter. On opening the sac it is found to contain a thick greenish black purulent material

similar to that already seen in the left ureter, and the index finger can be passed directly from the sac into the dilated ureter. Both the internal and external surfaces of the sac are covered with mucous membrane which shows patches of false membrane formation similar to those seen in the ureter and bladder. The sac wall appears to be of the same thickness throughout.

From the normal site of the right lower ureteral orifice there projects a similar but much smaller sac three centimeters in length; it is not nearly so tense as the one on the other side. On the inner side of this second sac is an opening the size of a pin's head, from which urine escapes; there is apparently no cicatricial tissue about this opening. The sac communicates freely with the left ureter. The prostate gland is slightly enlarged, but not sufficiently so to offer any obstruction to the outflow of urine.

The urethra is free from obstruction throughout its entire course. A microscopical examination of the sac wall shows that between the two layers of mucous membrane lies connective tissue containing many bundles of unstriped muscle fiber.

Remarks. This peculiar prolapse of the mucous membrane of the lower end of the ureter and that of the adjacent part of the bladder is not of common occurrence, although we find some similar cases on record.

All of these cases seem to come under two main categories:

1. Those cases in which there is distinct evidence that the condition is due to congenital deformity.

2. Those cases in which the process has apparently resulted from some acquired abnormality of the genito-urinary tract. By far the larger number of cases present distinct evidence of congenital malformation; in fact, out of the thirteen cases which we have been able to collect, ten were evidently of congenital origin, death occurring in five of these in the early years of childhood.

All of these five cases occurred in female children, and in four of them, those of Davies-Colley, Caillé, Beach, and Geerdts, there was not only a prolapse into the bladder, but the prolapsed sac actually passed through the urethra and appeared externally.

In the congenital cases proving fatal at a later date, the deformity was in some instances less severe than in the cases ending fatally in early life; in other instances the deformity was just as great in the late as in the early cases, the previous escape of the individual perhaps being due to the fact that he had escaped genito-urinary infection, which seemed to have been the cause of death in the majority of the cases which succumbed early in life. The deformity in these congenital cases consisted in most instances of a partial or complete closure of the lower ureteral orifice. In one case another form of deformity is cited, viz. a ureter having a long portion of its course in the bladder wall, and for this reason sub-

CASE 1

CASE I

jected to an abnormal amount of pressure from the bladder musculature.

Accompanying the deformity which was the actual cause of the condition, were often other evidences of congenital malformation. In several instances abnormalities of the kidney pelvis or double ureters were present, and one case is cited in which a deformity of the uterus was noted.

Of the cases in which there was no apparent congenital cause for the condition—and to this class we consider our case belongs—we could find but two examples, one reported by T. Smith, the other by Hutinel.

Smith's case, judging from his description and from an excellent plate which illustrates his article, was almost exactly similar to our own. In his case, however, urinary calculi were present on the right side in the prolapsed pouch, and on the left in the renal pelvis.

In Hutinel's case, which occurred in an old man, the subject of cystitis, the pouching only involved the left ureter. At the time of death the lower orifice of the left ureter was not blocked, as the pouch communicated with the bladder by a pouch the size of a three-franc piece, but there was evidence of a former blocking in a much atrophied kidney on the affected side. Unfortunately Hutinel does not state whether the abnormally large opening which existed between the sac and the bladder was apparently due to simple dilatation or to an ulcerative process.

Judging from the fact that in our case the abnormally small ureteral opening was contained in an area of cicatricial tissue, and from the history that the patient gave of a previous attack of acute cystitis, we are inclined to think that the blocking of the lower ureteral opening was due to an old inflammatory process with a subsequent formation of new tissue, which, in contracting, narrowed the ureteral orifice. It would seem likely that in the cases of Smith and Hutinel the same process might have taken place, as both patients showed evidence of old inflammatory disease of the genitourinary tract.

As far as the mechanism of the pouching is concerned the cases can again be divided into two classes, those in which there is a uniform dilatation from the pelvis of the kidney down to the end of the sac, and those in which the pelvis of the kidney and the main portion of the ureter are not dilated, the sacculation occurring only at the extreme lower end of the ureter.

In the former class of cases, to which ours belongs, the pouching can be explained by a theory, the essence of which was advanced by Smith in reporting his case. He suggests that the prolapse in these cases is due to the disproportion between the capacity of the ureter and kidney pelvis on the one hand, and the size of the lower ureteral orifice on the other. When, either from an extreme hydro-nephrosis or from an abnormal narrowing of the lower ureteral orifice, the urine is no longer able to escape from this orifice as fast as it is secreted, the distended ureter and kidney pelvis are compressed by the action of the abdominal muscles, particularly during urination and defecation, and a considerable downward pressure is brought to bear on the lower ureteral orifice. This finally results in the prolapse of its mucous membrane, and as

the mucous membrane of the bladder is directly continuous with that of the ureter, it is of course pushed downward at the same time, the result being a pouch covered on both sides by mucous membrane, and directly continuous with the dilated ureter and kidney pelvis.

In the cases in which no hydro-nephrosis or hydro-ureter exists—and most of the congenital cases are of this kind—we must seek for some further abnormality in connection with the lower end of the ureter.

According to Boström, this abnormality consists in the manner in which the ureter passes through the bladder wall.

In the normal condition, this author states, the ureters pass obliquely through the bladder wall, and their lower openings lie partly in the bladder musculature, the contraction of the muscle counteracting the downward pressure of the urine and hindering dilatation of the portion of the ureter lying within the musculature.

In the cases in which sacculation takes place the ureter is stated to pass straight through the bladder wall and to end just beneath the mucous membrane, in those cases where the ending is blind. From this it results, according to Boström, that the area of ureter surrounded by muscle is much smaller than normal, the resistance to the downward pressure of the urine is insufficient, and a prolapse of the mucous membrane of the ureter and bladder results. That the portion of the bladder wall which surrounds the ureter is not included in the prolapsed tissue is proved, Boström thinks, by the absence of muscular tissue from the wall of the sac.

Burckhard, in his paper, modifies somewhat Boström's theory, holding that the primary cause of the abnormality lies not so much in the abnormal position of the ureter as in the congenital lack of musculature in the bladder wall. He also states that the dilated portion of the ureter does not originate, as Boström believes, in the portion just beneath the mucous membrane of the bladder, but on the contrary begins in the portion which lies within the bladder wall, the proof of this lying in the fact that in his case he was able to demonstrate unstriped muscle fiber in the wall of the sac. The absence of muscle fiber in the sac wall in Boström's case he explains on the grounds of disappearance from pressure atrophy.

Case 2.—Anatomical Diagnosis. Something .... of the uterus involving the vagina and bladder : involvement of both ureters in adhesions : hydro-nephrosis and hydro-ureter : kinking of the right ureter from the passage of the right ovarian vein over the dilated ureter : arterio-sclerosis : heart hypertrophy ; recent vegetative endocarditis ; emphysema of the lungs ; diverticula of the intestine.

The following is the abstract from the autopsy protocol. Dr. Flexner referring to the ....

The ureter on the right side is greatly dilated. The greatest dilatation is in the upper third, next the hilum of the kidney. At its entrance into the kidney there is a pyriform bulging of the ureter, the walls of which are so attenuated at this point as to permit of the slightly turbid but almost colorless contents being seen through them. The ureter just next to the hilum, corresponding with the smaller part of the pyriform enlargement, has the size of a thumb. At a distance

of five centimeters from the hilum of the kidney a sharp bend occurs in the ureter, which is much constricted at this point by the passage over it of the ovarian vein, the walls of which are here thickened, but the lumen not entirely occluded. It is owing to the pressure from this vein that the upper part of the ureter is so much more dilated than the lower part, which will be described later. The pressure from above has caused the pushing downward of the upper portion of the dilated ureter, thus partly covering over the lower portion and causing an S-shaped bend or curve.

The lower portion of the ureter has a length of ten to twelve centimeters, and at the uterine end is embedded in firm adhesions. The dilatation of this part is somewhat less than that of the upper portion, and on an average it is about the size of the index finger. The lower part of the ureter contains the same faintly turbid fluid contained in the upper part. A probe cannot be passed from the slit up ureter into the bladder, even with the use of a moderate amount of force.

Remarks. In this case the hydro-ureter and hydro-nephrosis were evidently due in the first case to the inclusion of the lower end of the ureter in adhesions. The peculiar kinking, which was the interesting feature of the case, was due to the passage across the dilated ureter of what appeared to be the right ovarian vein, though instead of emptying into the inferior vena cava, as would normally be the case, it terminated in the right renal vein. As the vein was not in any way bound down, its mere tautness was evidently sufficient to cause compression of the dilated ureter.

We have been unable to find an account of a similar case.

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DISCUSSION.

Dr. KELLY.—Prolapse of the ureter has been observed in women out through the bladder and even projecting from the external urethral orifice.

I had a case of colon bacillus infection about a year ago in which the urine taken directly from the kidney was examined a number of times. After washing out the kidney a great many times, and finding that I could not clear up the pus in the urine, as I had done in other cases, I concluded that there must be some mechanical cause to keep up the disturbance, and I cut down and removed a stone.

The condition on the right ride of this case is a very important one. Cases of hydro-nephrosis of lesser degree, 10–15 cc. or more, have been attracting my attention more and more. In all of them we find a diminished amount of urea in the urine, for the kidney has been somewhat impaired in its functions. It is important to be able to recognize the condition; it cannot be palpated through the abdominal walls, but can be made out by introducing my renal catheters in women. These cases must be handled carefully because of the increased liability of infection. If one side is hydro-nephrotic and the other side has suppurated, then we must proceed with unusual caution in any surgical interference. In a recent case the urinary analysis showed a percentage of urea on the sound side of 2.6 per cent. and only 0.3 per cent. on the hydro-nephrotic side.

Dr. FLEXNER.—We have had very scant opportunity in the pathological laboratory to make bacteriological examinations of cases of wound diphtheria, the case reported by Dr. Blumer being the second one in several years. The previous case, upon which I performed the autopsy, was associated also with the genito-urinary apparatus and followed the operation of perineal section for stricture of the urethra. Previously there had been cystitis, pyo-ureter and pyo-nephrosis. The diphtheritic process extended from the external wound through the bladder and ureters into the pelves of the kidneys, which were more or less completely involved. The micro-organism which was separated from the local inflammations was the staphylococcus pyogenes aureus.

Of course these cases are examples of diphtheritis, and not of diphtheria, and in the great majority of cases of so-called "wound diphtheria" the pyogenic cocci, and not the bacillus diphtheriæ, are the causative agents. Examples of wound diphtheria caused by the diphtheria bacillus have been reported, these having usually occurred in persons suffering from faucal diphtheria. Brunner has, however, found the bacillus diphtheriæ in cases in which no history of faucal diphtheria could be obtained.

NOTICE.

TUMORS IN THE MOUSE.

By L. E. Livingood, M. D., *Fellow in Pathology, Johns Hopkins University.*

The necessity of broadening our knowledge of pathology as well as deepening it, has forced itself very emphatically before workers in this subject in recent years.[5,11] Especially is the study of morbid conditions occurring in animals used commonly in experimentation, of interest and importance, lying as they do in closest relation with our studies of the human conditions.

It has thus occurred to Dr. Welch, to whom my heartiest thanks are due for his happy instigation, that a more minute study of a series of tumors found growing spontaneously in mice in captivity would prove an interesting problem.

The many attempts at inoculating and grafting tumors, for the most part carcinomata, into animals, especially the more or less successful attempts recently made by Moran,[1] Boinet,[2] Mayet[3] and others,[9,12] have interested me to study the possible homology and analogy of these tumors to those found in human beings, and the discoveries of possible parasites, to a search in the field of etiology.

Tumors in certain domestic animals were noted and more or less carefully described by the ancients. Huzard in the XVIII century was the first to call attention to their frequency in carnivora. After 1825 we find various tumors in animals described by Trousseau, Leblanc,[4] Semmer[6] and others. Cadiot[6] (1894), in reviewing the carcinomata in dogs and horses, asserts that all animals will probably be found susceptible to carcinomata, which he claims to be the most frequent form.

Moran describes a tumor appearing spontaneously in a mouse, lying in the subcutaneous tissue but not attached to the skin. He describes it superficially as of tubular-gland type.

No. 1, of the series which I ask leave to bring before you to-night and of which Fig. 1 is a partial picture, was found in the right lung of a white mouse dying of experimental bacterial infection. It projected from the upper surface of the middle lobe as a small white boss about 5 mm. in diameter, slightly friable and apparently softer in the center. The lung tissue about it was congested. No other growths were noted.

Microscopically the boss presents the appearance of an adeno-carcinoma. At one point it may be seen arising from within a bronchus, growing as a papilloma within and, at one point, breaking through its walls and dispersing in the surrounding tissue. The greater part of the tumor is made up of infiltrating fingers of epithelial cells. The cells are of irregular columnar or polygonal type with oval vesicular nuclei. They are often arranged in single rows lining a long cul-de-sac, or they project into the surrounding tissue in solid masses. There is nowhere distinct basement membrane nor transverse section of a duct or tubule. The connective tissue stroma is very scanty, the infiltrating fingers alone seeming to restrain one another and causing, by mutual pressure, irregular growth. About the periphery and less markedly in the midst of the tumor there are areas in which the tumor has undergone disintegration, shown by fragmentation of nuclei and breaking down of cells.

The alveolar cells and connective tissue cells about the tumor have proliferated, giving the lung a carnified appearance.

No. 2 was removed during life under surgical precautions, from the neck and shoulders of a white mouse.

An alcoholic specimen of the tumor shows a small firm lobulated mass, partly encapsulated, about the size of a chestnut; the surface is irregular; the interspaces are filled with coagula. On section, however, the tumor presents a rather uniform white color and firm consistence. To this tumor is attached a small one of less uniform structure and color.

Macroscopically the appearance is that of sarcoma, but microscopically it is that of a true gland. It is divided into lobules by thick bands of connective tissue extending in from the dense fibrous capsule. These connective tissue elements show signs of proliferation.

The tumor is tubo-racemose in type. The tubules and acini are lined usually with a single layer of cuboidal or columnar epithelium, resting on a basement membrane. Frequently the lumina of the tubules are filled with cells forming solid epithelial cords, in which the cells are compressed and distorted. Again the lumina are wide and free. No ducts are apparent. The cells are throughout of the same character, although immediately under the capsule in some places they are flattened and compressed, looking like deeply staining fibrous tissue cells.

At one point the tumor elements have worked their way between the fibers of the capsule, at which point the capsule is hæmorrhagic. The smaller lobe is a lymphatic gland which has not been invaded, although firmly adherent to the capsule of the tumor at the point of infiltration. Its blood-vessels are much congested.

On the opposite side of this gland is a small nodule of normal glandular structure.

Several months after removal of this tumor there was a recurrence at the seat of operation (Fig. 2), and associated with this, on the death of the mouse, was found a metastatic deposit in the lung. This tumor was of the same type as the original one, an adeno-carcinoma, presenting three distinct appearances as shown in Fig. 2 : 1) normal gland structure, in which the acini are frequently filled with cells : 2) more truly carcinomatous growth, in which the gland type is lost through the proliferation of the cells, although the clumps of cells still remain hemmed in by the basement membrane : 3) a dilated condition of the alveoli, leading to thinning of the walls.

No. 4 is a tumor projecting from the _____ _____ _____ of a white mouse; with this was a _____ _____ _____ in the lung.

The tumor in alcohol represents a rather uniform lobulated growth about the size of a hickory nut, consisting of two hemispheres, lying immediately beneath the skin, to which, however, it is not adherent. It is distinctly circumscribed, through the _____ the _____ surface may be felt. On section, it presents a uniform firm _____ _____ _____

fied it shows a dense fibrous capsule enclosing the elements of a true carcinoma, consisting of long solid epithelial cords and culs-de-sac and, likewise, elements of more glandular appearance, in which acini are sometimes lined with a single, sometimes with a double layer of cubical epithelium. The epithelial elements are in certain areas separated by considerable young connective tissue and have atrophied. Certain areas present marked necrosis of epithelial cells, the lumina of some tubes being filled with necrotic elements.

The connective tissue stroma, which is quite abundant, is in places extremely vascular, and in others its cells are widely separated, giving it a myxomatous appearance.

There are several lung metastases. Fig. 3 shows a small one arising apparently within a lymph space.

No. 4. A tumor occurring in the axilla of a grey mouse, is about the size of a hickory nut, hard, nodular, appearing immediately beneath the skin, to which in places it is firmly adherent. It is of firm consistence and yellow color (alcoholic specimen). On cross section it differs from the other tumors in being more irregular in color and consistency. There are several dark, softer areas on its surface.

Microscopically the tumor is made up in part of irregular gland structure with a single layer of cubical cells lining the alveoli, but for the most part is composed of cords of polyhedral epithelium. It may be seen projecting up into the corium of the skin, but at no point is it in communication with the epidermal tissue. Certain areas are necrotic. In some places what appear to have been gland acini are now dilated spaces lined by a single layer of flattened cuboidal cells and containing a granular material, remnant of disintegrated cells. The connective tissue stroma shows signs of proliferation. In this, as in all the preceding tumors, karyokinetic figures were found in abundance in the tumor cells.

The 5th tumor (Fig. 4) represents one of several nodules, small, measuring 4 mm. in diameter, of granular appearance, projecting from the skin on the fore- and hind-leg of a wild mouse. These tumors were excised and sections show them to be pure adenomata of the sebaceous glands. Some of the gland acini appear normal, being filled with their peculiar opaque, coarsely granular epithelial cells with small round nuclei. The acini are limited by a distinct membrane. The cells lying next to it are small and compressed; as one approaches the center of the acinus they become larger and show the appearance of their peculiar degeneration, the nuclei becoming obscure and the protoplasm swollen. Some of the acini are distinctly cystic, partly filled with fine granular material derived from the degenerating cells. The dilated ducts may readily be traced at times through the hair follicles to the periphery. The epithelium of the hair follicles does not seem to have proliferated. Among the gland cells no distinct karyokinetic figures are to be made out.

Beneath the tumor the subcutaneous tissue has normal appearance, limiting all growth further downwards. The small glands found in almost continuous succession throw light on the presence of the one in tumor No. 3.

The type of these tumors is, in general, with exception of the last, adeno-carcinoma, some showing an almost pure carcinomatous appearance. And in this connection it is interesting to note that the macroscopic appearance is almost invariably that of sarcoma ; a nodular surface, well circumscribed by fibrous capsule, uniform firm structure, which might naturally, as Cadiot holds, have led the older writers to place sarcoma as the most common tumor in animals. From this series carcinoma should certainly have that place. The elements making up the tumor and method of their growth differ in no way from those of growths occurring in human beings. Two of them give metastases which preserve the original type of structure and cells. One gives further evidence of its malignant nature by recurrence three months after removal. The last occurred as multiple tumors. The rate of growth of none was noted, except the recurrence of tumor No. 2, which was very rapid.

The position and character of all of them are suggestive of their point of origin. Three occur primarily about the neck and breast of the animals. All of these are superficial, lying immediately beneath but still not involving the skin. Their elements are not those of epidermal epithelium, but are distinctly glandular, and suggest at once as their point of origin the mammary gland. The origin of the last is obvious.

The occurrence of the primary tumor in the lung is interesting when we consider the rarity of that occurrence in man.

The capsule we must look upon either as a thickening of the original gland capsule or a proliferation and condensation of the connective tissue about the growing mass.

I may say in closing that in none of them, with the ordinary methods of staining, have I discovered anything which resembled the " coccidia " found by Ruffer and Walker,[7] which they wish to associate with the etiology of the condition, nor the blastomyces of Busse[8] and Sanfelice.[9]

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THE MALARIAL FEVERS OF BALTIMORE.

An Analysis of 616 cases of Malarial Fever, with Special Reference to the Relations existing between different Types of Haematozoa and different Types of Fever.

By WILLIAM SIDNEY THAYER, M. D., AND JOHN HEWETSON, M. D.,
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218 pages, quarto, with plates and charts. Price $2.00, Postage paid.
[Forming part of The Johns Hopkins Hospital Reports, Vol. V, 1895.]

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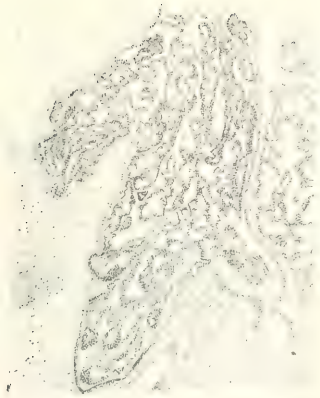
FIG. 1.
Adeno-carcinoma occurring primary in
lung of mouse

FIG. 2.

(in the breast)

FIG. 3.
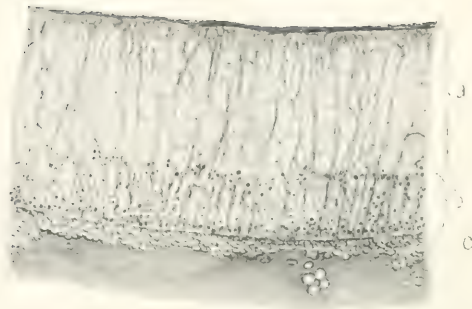
CASE I.

a.—Atrophic degeneration of the retina in its anterior part. Disappearance of all the retinal layers as far back as the Internal Granular Layer. Müller's Fibres are wavy in their course and appear swollen.

b.—Remains of the Internal Granular, External Molecular, and External Granular Layers.

c.—Several layers of albuminous transudate.
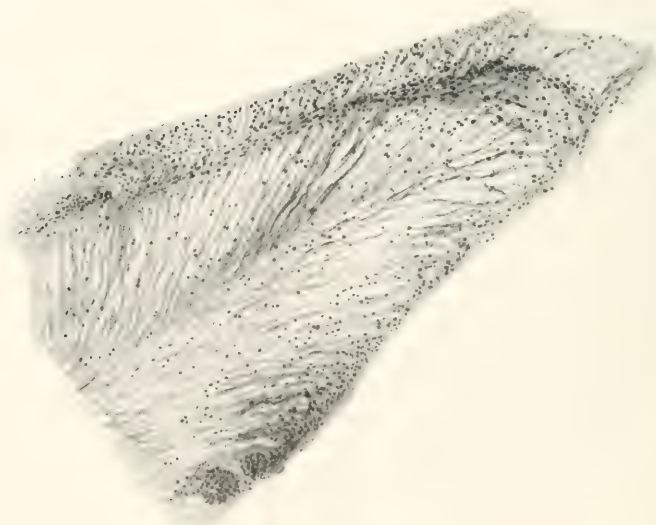
CASE

Fibrillary Degeneration of the Vitreous Body.

THE ANATOMICAL CHANGES IN TWO CASES OF RETINAL DETACHMENT.

By Robert L. Randolph, M. D.

I have selected the following cases as being fairly typical of the two principal conditions leading to detachment of the retina. Case I was a spontaneous detachment due to fibrillary degeneration of the vitreous, and Case II was where a small round cell sarcoma had pushed the retina away from the choroid.

Case I.—The detached retina as it sprung from the papilla looked like a funnel having a neck about one-fifth of an inch long, and which at this distance from the papilla commenced to assume the funnel-like shape. The retina was detached below all the way around to the ora serrata. Above and at a point one-sixteenth of an inch posterior to the ciliary muscle it was lying in position. From this point it turned backwards, and then passed directly down to a point which lay in the pole of the lens, and from here it took a course forward and then upward, and finally lost itself in the ora serrata. That part of the funnel which had an upward direction was thrown into numerous and intricate folds and enclosed in its meshes a mass of vitreous body, while that part which passed below was composed of the entire thickness of the retina, which appeared quite normal. The peculiarity of this portion was the absence of folds. The inner surface of the retina at the widest part of the funnel was covered with a thick mass of vitreous body, and the angle which was formed by the ciliary body in front and by the retina behind as it fell backwards and downwards from the ora serrata, was filled with coagulated material and fine fibrillæ, which latter passed forward and served to form numerous bridges across it. The ciliary processes were covered posteriorly with several layers of the vitreous fibrillæ. The zonula was not distinguishable as such, it no doubt being merged into the fibrillæ. That portion of the vitreous space lying between the retina and choroid was empty. No doubt we had a fluid here during life. At some points anteriorly could be seen what are described by Nordenson as the choroidal tufts, "chorioidalzotten," which appeared like little bridges uniting the retina and choroid. There was nothing worthy of note about the choroid, and the same could be said of the ciliary body, iris and lens. There was a good deal of material in the anterior chamber which was probably the transudate coagulated by the hardening process.

Microscopic changes.—The changes in the retina were very noticeable, and particularly in the anterior part of the eye. The anterior portion of the detached retina was the seat of the most marked degenerative changes, the retina itself resembling closely a reticulated tissue in which there was hardly a trace of the several layers. Posteriorly it was easy to recognize the various layers, but they gradually disappeared towards the ora serrata, and the only evidence of a layer was a single row of granules which marked the course of the external granular layer.

The layer of rods and cones was intact in several places, but this condition was generally found in the posterior half of the eye. At those points where the retina was thrown into very intricate folds this layer was more apt to be wanting, but even in this situation it was sometimes present. In those situations where the layer of rods and cones was absent, its place was filled with a mass of albuminous drops which were arranged in layers one on top of the other. On the inner surface of the retina one could see the meshes of the vitreous fibrillæ, which appeared to be exercising traction on the surrounding retina. This layer of fibrillæ was tolerably rich in nuclei.

In one place the retina had curved around so as to form a loop; on one side of this loop all the layers of the retina were to be seen, with the exception of the ganglion cell layer. The layer of rods and cones could be plainly seen as well as the external limiting membrane. On the opposite side of this loop the only layers which were present were the external granular layer and the external molecular layer, the latter to a very limited extent. The inner layers in this situation had been pulled out of all shape by the vitreous fibrillæ. The external granular layer presented generally a very irregular border line, appearing at points as papillæ-like projections due, I think, to the folding of the retina. The nerve fibre layer was not easily recognizable, and the layer which occupied its normal position, and which to a large extent was the nerve fibre layer, was the seat of numerous nuclei. The radiating fibres of Müller showed generally a wavy course. The line of demarcation between the nerve fibre layer and the ganglion cell layer was difficult to make out. This was no doubt to be attributed to the traction exerted upon the nerve fibre layer by the fibrillæ, and also to the very irregular course followed by the radiating fibres. As a rule the ganglion cells had dropped out of the section, and it was impossible to identify this layer.

An examination of the neck of the detachment, or, as I have called it, the neck of the funnel, showed no remains of the vitreous body. This neck appeared to be a mass of connective tissue, in which it was impossible to distinguish any of the layers of the retina, though it seemed to be made up largely of the granular layers. At the papilla there was no semblance of the retinal structure. There was, too, at this latter point a notable absence of blood-vessels. Upon the neck of the detachment, on all sides, several layers of albuminous drops rested. The fibrillæ were for the most part devoid of nuclei. They often looked as though they came directly out of the retina and made their way into the vitreous body, or as though they were prolongations of the radiating fibres, so intimate was their connection.

Choroid.—On the inner surface there were several layers of albuminous transudate resting on the pigmentary layer of the retina, which had remained behind, as it usually does in such cases. Increased nucleation was everywhere present throughout the choroid, and further than the points just mentioned there was nothing noteworthy in this part of the eye.

The vitreous body was wanting entirely in the posterior portion of the eye. Just behind the lens it seemed to be transformed into a granular debris devoid of fibrillæ, while in other portions it was composed apparently of nothing but the fibrillæ which have been described. The lens, iris and ciliary muscle were normal.

The chief points, then, about the pathological anatomy of this case were: 1. The widespread atrophic degeneration of the retinal layers, and especially of the layer of rods and cones. As a general thing the granular layers were the only layers that were preserved. 2. Swelling of Müller's fibres. 3. The presence of albuminous drops in various localities, and especially between the choroid and retina, and along the neck of the detachment; and finally the transformation of the vitreous body into fibrillæ. I may say in connection with this case that I am indebted to Dr. Mary E. Hennessy, of New York, for the specimen, who unfortunately was unable to furnish me with the history.

Case II.—The second case was that of a boy, aged seven years, who came to the Johns Hopkins Hospital early this spring. His parents had taken him to an oculist several months before ; at that time his eye was not thought to be in a serious condition. He had been complaining for the last three weeks of severe pain in his right eye, and his parents had noticed a whitish yellow reflex from this eye. This reflex was very noticeable when he came to the hospital. The tension of the eye was decidedly elevated and the conjunctiva injected. Vision was completely gone. I advised enucleation and the eye was removed the following day. The macroscopic condition was as follows: The tumor involved almost the entire nasal half of the retina, filling up that side of the vitreous space both above and below. It extended back and seemed to proceed from the nasal side of the optic nerve, and advancing into the vitreous, stopped at a point about a quarter of an inch posterior to the lens. Over the area occupied by the tumor there was no trace of the retina to be seen. On its free side the growth was quite nodular, and one of the nodules projected across to the temporal side of the eye and almost reached the retina on that side. The retina in the temporal half of the eye was completely detached.

Microscopic changes.—The tumor was scant in intercellular substance and was made up of small round cells. Bloodvessels were tolerably numerous and they were usually filled with red blood corpuscles. Large areas of the growth failed to take on the hematoxylin stain, but stained with eosin. These were evidently necrotic areas. Hemorrhages were not infrequently seen. Wherever the tumor was present the retina was indistinguishable, the tumor having grown into it. The tumor cells were found in the optic nerve as far back as a quarter of an inch from the papilla. The vitreous body had been crowded over to the temporal side of the eye and had been transformed into the characteristic fibrillæ, which were evidently exerting traction upon the retinal folds. These fibrillæ had pulled the retina into intricate folds in the anterior portion of the eye, and just behind the lens the traction was enough to pull the retina backwards far enough to leave only a short narrow bridge separating the latter from the growth. The layer of rods and cones was nowhere visible,

and just as in the first case, the ganglion cells in the ganglion cell layer had dropped out of the section. The internal and external granular layers were clearly definable, say from the equator around to the ora serrata. The retina posterior to the equator was very much thickened and broken down, failing to stain. At one point only, and for a very short distance, the external limiting membrane could be seen. The fibres of Müller were somewhat swollen and had a very wavy course, a course which more or less disturbed the position of the retinal layers.

The choroid nearly everywhere had been attacked by the growth, that is to say, large and small heaps of the sarcoma cells were present in this coat, and generally they were resting under the pigmentary layer, this condition extending around as far as the ciliary region on the nasal side, and on the temporal side a short distance from the papilla. There were no albuminous drops.

The principal changes in this case were the conversion of the vitreous body into fibrillæ and the atrophic degeneration of the anterior portion of the retina.

It would seem, then, that fibrillary degeneration of the vitreous body is to be found in both classes of cases. In the case of spontaneous detachment it was evident that the fibrillæ were largely concerned in pulling the retina away from its normal position, and from the arrangement of the retinal folds shrinkage or contraction from within must have been going on. In this case, as will be seen from the drawing, there was a considerable exudate consisting of layers of albuminous drops resting on the membrana limitans externa, which exudate no doubt played a part in separating the retina and choroid. These two conditions would explain the detachment in the first case and similar ones. In the second case the presence of the sarcoma was sufficient to lift the retina from its position, though even here it was evident at a glance that the retina was subject to a force from within which helped to pull it still further away from the choroid. I failed to discover a rent in the retina in either case.

In conclusion I may say that the most striking anatomical change in these two cases was the fibrillary degeneration of the vitreous body, a condition which, I think, is found to a more or less extent in every case of retinal detachment, and which no doubt is the chief element in the pathogenesis of the disease.

THE BUBONIC PLAGUE.

[The substance of a report made to the Journal Club of the Johns Hopkins Hospital by ????? ?????? M. D.]

In October of 1894 an abstract of a report to the Journal Club of the Hospital, upon the subject of the bacillus of the plague, appeared in the Hospital Bulletin. The account there given of the micro-organism which had but a short time before been isolated from a number of cases of the black plague by Drs. Yersin and Katisato, and which was believed to be the cause of this devastating pest, was drawn from the reports of these investigators published at that time. The expedition sent by the Japanese government, at the head of which was Dr. Katisato, contained Dr. Aoyoma, whose mission it was to study the clinical and pathological features of the disease. Dr. Aoyoma became himself infected with the disease a short time after the beginning of his studies at Hong-kong, and although he recovered, the report of his studies has only recently appeared.* As was to be expected, these relate more particularly to the symptomatology and the pathological anatomy of the disease, although account is taken of the epidemiology and to a less extent of the bacteriology and of the mode of infection. In order that the first report given in the Bulletin may be in a manner complete, it is considered desirable to append an abstract of Dr. Aoyoma's recent report.

In May of 1894 the Japanese consul in Hong-kong announced to the Japanese government that the plague had appeared in Canton. Immediately following, a quarantine first of nine days and later of seven was set upon incoming ships, and Dr. Katisato, with his assistant Ishigami, and Dr. Aoyoma with his assistant Miyamoto and medical student Kinoshita, were sent to Hong-kong, where they arrived on the 12th of June. Through the kindness of Dr. Lowson they were permitted to arrange for their work in one of the rooms of the Kennedy Town Hospital, where on the 14th they had established themselves ready for work. Unfortunately Aoyoma and Ishigami became ill with the pest on the 28th of June, owing to which the studies which are here to be given were limited to fifteen days of active service. In this time 19 autopsies were held and 45 clinical cases studied, the latter more or less completely. In addition to these the opportunity of seeing a large number of cases in the Chinese hospitals had been embraced.

Respecting the situation of Hong-kong and the condition of the soil, its inhabitants and houses, the following may be stated: Hong-kong is one of the widest of the islands situated in the Gulf of Canton stream, and lies 142 km. southeast of the city of Canton, and 62 km. east of Macao, and is separated by a small body of water, which is used as a harbor, from the mainland. The island is mountainous, from two to five miles in length, and consists of granitic rock. Respecting the climate it may be stated that it is tropical, and the warmest months of the year are from March to November. The winter is also warm, and snow is not known in that locality.

Victoria, which is the principal town, extends from east to west along the north coast, between the sea and the mountainous background, and follows the latter, as it is built in part upon the mountain side. In the most easterly part we meet the barracks, villas, factories and the European shops. The westerly and middle parts, which are lower, are the Chinese quarters. The portion of the town which was most affected is known as Taiping-chan, which lies in the middle of the city. As regards the streets themselves, excepting that they are narrow, they are the equals of the best European streets. The houses, which are usually two stories in height and built after the European fashion, number about 7900, of which 6600 belong to the Chinese population.

The number of inhabitants of Hong-kong is difficult to ascertain and probably reaches the neighborhood of 250,000. The report obtained from the water-supply bureau gave 163,949, of whom 151,974 were Chinese. The overcrowding of the houses of the Chinese workmen has greatly increased during the past ten years. It is stated that in the ten years from 1881 to 1891 the number of inhabitants of the city increased 41 per cent., while the houses increased only 13 $\frac{9}{10}$ per cent. The densest population is found in Taiping-chan, where it would appear that in a house area of 0.173 acre 3740 Chinese live. The streets of this part are very narrow, the houses are two-storied, the windows small and few in number. The houses, which are long in form, are separated by partitions into two parts, each of which is further subdivided into a number of large rooms. In the earlier times one of these rooms housed a single family, but at the present, owing to overcrowding, these rooms have been divided by subpartitions into an upper and a lower compartment, and these compartments further by upright partitions, so that several rooms have been constructed out of the original ones, in each of which a family now lives. The average size of the main room is 26x14 feet by 10 feet high, and contains eight partitions averaging 7x6 feet by 7 feet high, over which a sort of loft is often built to increase the accommodation, and in a room of these descriptions from 16 to 25 people live.

The canalization is constructed so that one system of pipes receives the washings from the rains and the other the sewage from the kitchens, etc. The first works perfectly, whereas the other is for the most part in a very bad condition, so that ????? ?????? ????? ????? ????? upon the houses.

The city itself is provided with an excellent water supply. ????? ????? ????? ????? ????? clothing of the Chinese is hygienically to be recommended. The only difficulty to be pointed out is, that although well conceived for the purpose, it is never under any circumstances subjected to washing, which had a squid-like of their bedding. The personal habits of both the men and the women are almost beyond belief in their uncleanliness and neglect. Cleanliness or their part, or anything approaching it, is but absolutely unknown art.

As regards the cause of the plague, it may be said that Katisato discovered bacilli in the blood and in the lymphatic glands which differed somewhat in their morphological characters but which agreed in their cultural properties. According to Katisato, the bacillus which appears in the blood resembles the organism of chicken cholera, possesses a capsule, the middle portion staining very faintly; while the bacillus obtained from the lymphatic glands is somewhat longer, has rounded ends, and stains more uniformly than the other. The bacillus obtained by Yersin is stated to have rounded ends, to be easily stained with the aniline dyes, and to be decolorized with Gram's method. The ends again stain more uniformly than the middle part. According to Katisato, the organism would at times stain by Gram's method, and at others not. Aoyoma, however, observed that those contained within the lymph glands were decolorized, and those in the blood stained by this method. The number of organisms contained within the blood is usually not large, and may be so small that it is necessary to prepare a large number of cover-slip preparations in order to find sufficient for a diagnosis. On the other hand, they are found abundantly in the affected lymphatic glands.

The study of the tissues has shown that in the lymph glands a variety of bacteria may be met with. As a constant and predominating species the lymph gland bacillus of Katisato is found, although in rare cases micrococci predominate. Careful observation, however, shows within these masses greater or less numbers of the pest bacilli, the streptococci occupying the blood-vessels rather than the gland substance. The pest bacilli in the tissues stained less intensely in alkaline methylene blue solution than the streptococci, and the staphylococci least of all. It is stated that while the streptococci retain the Gram stain, the bacilli and the staphylococci do not. It is suggested by Aoyoma that the forms described by Katisato as occurring in the blood and retaining the Gram stain may have been pairs of cocci and not bacilli at all. He regards the association of the bacilli and cocci as of great importance, inasmuch as in the greater number of instances the affected glands suppurate, while a very small fraction do not. Hence it is considered that the suppuration is caused not by the plague bacilli which are always present, but through the action of pus-producing bacteria which entered along with the former or later than these; and Aoyoma has further found that in suppurating glands the plague bacilli are either much diminished in numbers or have entirely disappeared.

It may be recalled that in the first reports of Katisato and of Yersin they stated that the bacilli might enter the body first through the respiratory tract, second the digestive tract and third, excoriations of the surface. Aoyoma, on the other hand, expresses the opinion that in the great majority of cases, if not in all, the entrance is through external wounds. He points out that physicians and nurses who are in attendance upon infected individuals and spend much time in the places in which the sick are kept, rarely become infected with the disease. In this epidemic, of all such persons who were in attendance upon the sick, only three Japanese physicians and one Chinese physician became infected, the nurses having entirely escaped. During the prevalence of the epidemic 300 English soldiers volunteered to cleanse and disinfect the

Chinese pest-houses. Of these only ten became affected with the disease. Thus it would appear as though an actual pest atmosphere did not exist and that the infection did not take place through the inspired air. Moreover, Aoyoma did not observe that the tracheal or bronchial glands were in a condition of intense inflammation, which he presumes would have been the case had the bacilli invaded through the air passages.

Respecting the question whether the organisms are taken into the body through the drinking water or with the food, it may be said that the Chinese do not drink unboiled water, and never under any circumstances eat uncooked foods. That portion of the town (Taiping-chan) which was most infected, and in which the hygienic conditions were the worst, received its drinking water from the general supply. It is true that Katisato was able to cause infection in mice by introducing the bacilli into their stomachs through glass tubes, but it is stated by Aoyoma that Katisato does not any longer regard these experiments as being certain proof of infection through the alimentary tract. It is noteworthy that at autopsy the lymphatic apparatus of the stomach and intestines and the mesenteric lymph glands were never found greatly inflamed, and the last contained very small numbers of the bacilli only, or in certain cases none at all. Hence it is stated that all physicians who observed this outbreak of the pest were forced to the idea that the bacilli entered chiefly through external wounds.

In the great majority of cases the deep inguinal and the axillary glands, and in a small number of cases the superficial inguinal glands, of one side were first affected and afterwards other glands became involved. This fact is explicable only upon the assumption that the organism entered through small defects of the skin which were present either on the feet or the hands; and as the working class of Chinese usually go barefoot, such small defects can easily be imagined to exist. Further, as is known, the lymphatic vessels of the feet run to the deeper and lower inguinal glands, thus exposing these first in the great majority of cases. The superficial inguinal glands receive the lymphatics of the penis and the skin over the lower portion of the abdomen, and these are but seldom primarily affected. Of the nine Japanese whom Aoyoma observed, two women showed affection of the axillary glands, one of the sub-maxillary glands, whereas in the other no glandular affection could be detected, notwithstanding the fact that the bacilli were found in the blood. Of the Japanese men, four showed swelling of the axillary glands, and one only of the inguinal glands. This is interesting when it is considered that the Japanese do not go barefoot. It may also be mentioned that among the Chinese the women show affection of the axillary rather than of the inguinal glands.

The wounds through which the infectious agent enters show, as a rule, no reaction. Notable exceptions to this statement are his own case, in which a lymphangitis was present, and that of his assistant, Nakahara, who succumbed to the disease and in whom lymphangitis was also observed, in both cases beginning in the hand and extending towards the axilla. As regards the manner of diffusion of the bacilli, nothing new has been offered in this report. The period of incubation of the disease is given at from two to seven days; and as regards

the age and the sex of those affected, it may be said that the greater number of cases occur in young males.

The following table gives the relative proportion of men, women and children affected:

Men	62.40 per cent.
Women	19.23
Boys	8.92
Girls	9.45

It is worth noting that Aoyama himself did not observe a single case in newly-born children or sucklings, although an English physician, Dr. Lowson, claims to have seen five or six cases among the latter.

The mortality in Hong-kong from the beginning of the disease until the 2nd of September is given as follows:

	Number Affected.	Number Died.
Europeans	11	2
Japanese	10	6
Manilanese	31	1
Urasinese	3	3
Indians.	13	10
Portuguese	18	12
Malayanese..................	3	3
West Indians...............	1	1
Chinese	2619	2447

Symptomatology. The symptoms of the disease during the last plague were not, as was stated by most authors, protean, but they were quite simple. The disease began for the most part without prodromata, with a chill, or even in the first instances with pain and swelling of the glands and with succeeding chill and fever. Prodromata when present were usually short and varied in duration from a few hours to two or three days, or perhaps somewhat longer. The symptoms in the prodromal stage are prostration, headache, nausea, vomiting, loss of appetite, vertigo, and only rarely pains in the lumbar region or in the back. In the cases of the affection of the more intelligent population, even before the outbreak of the fever, slight swelling and pain were noted in the glands; whereas in the more obtuse Chinese these slighter phenomena were not noticed.

The temperature rises quickly to 39° or 40° C. or even higher, and remains high during the progress of the disease. Delirium sets in early, for the most part after the second day, and continues day and night, although in the lighter cases it may be absent during the day. On the other hand, severe cases occur in which from the beginning until death supervenes the functions of the brain are intact. The pulse is usually of good volume, as a rule is dicrotic and varies in frequency from 90 to 120 per minute. The spleen is palpable usually after the second or third day. It rarely can be felt more than a few cm. below the costal margins. The liver also is usually enlarged and palpable.

The urine is in most instances of dark color, cloudy, contains albumen, and does not, as a rule, give the diazo reaction. A few casts, either hyaline or granular, and white corpuscles are usually present. Very rarely the urine contains blood.

After the first or second day the glandular affection becomes more marked, and those glands first involved may reach the size of an egg. The pain increases with the growth in size, although in some cases it may be absent excepting upon pressure. The glandular affection is characteristic, inasmuch as it begins in one group and then involves in succession others, as for example first the inguinal, then the axillary, then those of the neck, and finally the submaxillary glands. The glands of the neck, of the elbow and the knee are seldom primarily affected. Only very rarely do several sets of glands become enlarged at once. Very soon after the swelling of the glands the periglandular tissues become involved and then later the skin. In the milder cases, suppuration may not occur and the swelling gradually diminish and finally disappear. On the other hand, suppuration may occur even in glands but little enlarged.

The temperature rises rapidly to 39 or 40 degrees, and in rare cases to 41½ degrees. In other instances the rise is more gradual. After remaining continuous for three or four days, there may be a critical fall, or the decrease may be gradual. In severe cases which recover the fever lasts from one to three weeks, and towards the end presents an irregular and remittent type. In not a few cases after the temperature has returned to the normal at the end of the first or the beginning of the second week there is a relapse, the fever now assuming a remittent character. The remittent fevers are suppurative; the fever is very rarely from the beginning remittent and irregular.

Actual hemorrhages into the skin were observed but once by Aoyama, although congested areas are not infrequent. These latter areas disappear upon pressure and are believed to be caused by the bites of mosquitoes. Respecting the question of the appearance of an exanthematous eruption, it is stated that a rapidly disappearing erythema may occur. Symptoms referable to the brain, with the exception of the delirium, were very rarely observed. Fibrillary twitchings occurred before death, and actual convulsions were seen in very rare instances. In only one case was opisthotonus observed.

In the *Foudroyante* cases death may occur before any considerable glandular swelling can be made out: in the severest cases taking place on the second day. As a rule, death occurs from the second to the eighth day, and on an average on the fourth day. As suppuration of the glands rarely occurs before the tenth day it was not observed in these more rapid cases. When death takes place late in the course of the disease it may be due to a secondary pyæmic infection. The suppuration of the glands may continue for months, so that convalescence of the patient is rendered very slow and tedious. When suppuration does not occur the glands gradually become smaller, although the enlargement may remain slightly for two or three months.

Complications are stated to be quite frequent. Of these, nephritis occurs quite commonly in the severe cases. It develops as early as the third or fourth day of the disease, accompanied with the appearance of a moderate amount of albumen in the dark red urine, and microscopically hyaline and granular casts, as well as white and red blood corpuscles, are found. Œdema was rarely seen, and when present, of slight

grade, and anuria was never observed. The blood which is present in the urine is not derived from parenchymatous hemorrhages, but from small extravasations into the mucous membrane of the pelvis of the kidney and the bladder. Abscess formation in addition to the lymph glands was observed in the liver, lungs and other organs in the later stages of the disease. Icterus of a light grade, and presumably of catarrhal origin, was often present; in one case it reached a very high degree, and at the autopsy it was found that the common duct had been pressed upon by a group of enlarged lymphatic glands. Serous pleuritis occurred but seldom, and seemed when present to be associated with the enlargement of the axillary glands. Pneumonia was seen in a single instance only, but bronchitis was much more common. Rarer complications are periostitis, lymphangitis, furunculosis of the skin, phlegmons which have their origin in the suppurating glands, carbuncle, singultus, and bloody stools.

Respecting the question as to whether cases of the pest without glandular affection ever exist, it may be said that in three cases which came to autopsy and which were proven to have died of the plague, enlargement of the glands was not made out during life.

The blood presented a dark red color, and the estimation of the corpuscles showed that the red corpuscles were only inconsiderably or not at all diminished, while the white were always increased. The number of white corpuscles per cubic mm. varied from 20,000 to 200,000; a control count of normal blood in a Chinese gave 10,000 white corpuscles to the cubic mm. The increase in white blood corpuscles is in the poly morpho-nuclear neutrophilic variety. Eosinophilic cells were very rarely seen. It is stated that the blood platelets were increased in number.

During the short time that Aoyoma carried on his studies he made autopsies upon 19 cadavers. The following is in brief the result of his studies of these cases: There is not infrequently a post-mortem rise of temperature; in one case the temperature taken four hours after death in the rectum, with a thermometer which registered 43 degrees, could not be estimated because the mercury was driven to the top of the capillary tube. Post-mortem muscular contractions also occurred in a similar manner to those observed in cholera. The affection of the lymph glands in various regions of the body has already been referred to, and it remains to say that in no case did he find evidence of a primary affection of the pleural or peritoneal lymphatic glands. No matter in which part of the body the glands are primarily affected, the entire lymphatic apparatus of the body shows at least some swelling, and perhaps congestion as well. With the exception of minute ecchymoses nothing abnormal was observed in the heart. The lungs and the pleura were not the seat of inflammatory changes, although in the latter, in certain of the cases of primary axillary affection, an increased amount of fluid existed in the pleural cavity. The spleen was enlarged, and sometimes considerably so. The kidneys showed the lesions of cloudy swelling, and often were congested. Small hemorrhages occurred in the mucous membrane of the pelvis. The liver was enlarged and hyperæmic and the seat of parenchymatous degeneration. The stomach and intestines showed more or less injection of the mucous membrane and increase of the mucous section. The pia arachnoid was as a rule hyperæmic and very œdematous. Purulent inflammations were never present in this situation. In few cases a moderate number of small hemorrhages were observed in these membranes. The fluid within the ventricles was moderately, never greatly increased. The substance of the brain showed a moderate œdema and numerous hemorrhagic points. In one instance an extravasation of blood the size of a bean was found in the medulla oblongata, and in another one of the same size occurred in the pons. The pia arachnoid of the spinal cord was hyperæmic and œdematous. Lesions were not found in the cord itself.

The increase in size of the lymphatic glands depends upon several factors, namely, hyperæmia, exudation, hemorrhage, hyperplasia of the gland cells, and great development of bacteria. The bacilli which are present are found in the earlier stages in the lymph spaces about the follicles, and later they are found within the follicles, the lymph sinuses and the medullary cords. The cells of the affected gland undergo various degenerative changes and may become necrotic. They lose their nuclei in the latter case, and a variable amount of nuclear detritus is present among the degenerated and necrotic cells. The hemorrhages are not limited to the gland itself, but may be found, as well as greater or less œdema, in the periglandular tissues. The usual fate of the enlarged glands is to suppurate, although in certain cases the swelling may disappear without suppuration and the glands return to normal; while in still others a fibroid induration may result. The suppuration is either of the nature of simple abscess formation, or preceding this there may be a necrosis of the gland substance; in certain cases the suppuration does not remain limited to the glands, but extends into the periglandular tissue. Sections of the lymph glands showed a variety of bacteria. It is stated that in the primary localization various bacteria may be associated. Among these can be distinguished the pest bacilli and cocci, and among the latter both streptococcus and staphylococcus forms may be discovered. Aoyoma considers the association of these organisms as very important in determining the suppuration or non-suppuration of the affected glands. The spleen usually shows the presence of large numbers of bacilli, and among these more rarely micrococci. The pest bacilli were also, though not constantly, found in the interstitial substance of the kidneys and in the glomerular capillaries. They were also present in the inter- and intra-acinous tissues of the liver. The mesenteric glands sometimes contained the bacilli in small numbers; it is not stated whether or not they were found in the structures of the central nervous system.

DESCRIPTION OF THE JOHNS HOPKINS HOSPITAL.

By John S. Billings, M. D., LL. D.

ABSOLUTE ALCOHOL AS A DISINFECTANT FOR INSTRUMENTS.   A BACTERIOLOGICAL STUDY.*

By Robert L. Randolph, M. D.

For the past eight years I have employed absolute alcohol as a disinfectant for all cutting instruments used in operations upon the eye, and recently I instituted a series of bacteriological experiments to test the value of this agent as a practical disinfectant. The cataract operation demands a keener knife, probably, than any operation in surgery, and the peculiar objections to heat for sterilizing cutting instruments led me to adopt the use of absolute alcohol as the best substitute for heat. I have satisfied myself again and again that not only does moist heat, but even dry heat dulls the edge of instruments, and this I understand has been the experience of many surgeons. In making this contribution to our knowledge of alcohol, it is not with the idea that I am introducing a new disinfectant, for I am well aware that there are not a few ophthalmologists who use it as an agent for sterilizing instruments. No matter though how well satisfied we may be with aseptic measures, we cannot understand why they are satisfactory, or, in other words, how much they contribute to our success, until these measures have been subjected to bacteriological tests, and, as far as I know, no exhaustive series of tests of absolute alcohol as a disinfectant for instruments has been made.

The experiments of Koch go to show that alcohol possesses inferior germicidal qualities, in so far as its action upon the spores of the anthrax bacillus is concerned, the spores retaining their vitality after a submersion of one hundred and ten days in alcohol. This power of resisting the action of germicides exists in a marked degree in the case of the spore-producing organisms, as is shown among others by the works of Globig† and of Reinicke.‡ It is evident that in the case of the spores of the anthrax bacillus at least, absolute alcohol is practically useless as a germicide, but the negative results of Koch should not be taken as an evidence that absolute alcohol has no value whatever as a disinfectant. This is true only in so far as one organism is concerned, and that, too, an organism which, as far as we know, surpasses nearly all other bacteria in its vitality. It does not seem practical, then, to take Koch's results as a criterion for the germicidal value of absolute alcohol.

My experiments were undertaken at first to control, as it were, and to throw some light, from a bacteriological point of view, upon the method which I employ for sterilizing instruments in operations on the eye. These experiments were not intended to demonstrate the effect of alcohol upon any special organism, but to ascertain the value of this agent as a disinfectant for every-day conditions in eye surgery. The question arises, why not determine the effect of absolute alcohol upon some one or more of the commonly met with pathogenic organisms, for instance the so-called pus organisms, and be guided in my conclusions by results reached in this manner? We know for certain that the pyogenic bacteria are concerned in the production of many serious affections of the eye and its appendages, and that in those cases of sloughing cornea following the operation for cataract, to say nothing of panophthalmitis, one or more varieties of pyogenic cocci have been often found present in the affected tissues. No doubt many a staphylococcus and streptococcus infection has been conveyed to the eye by the instruments. There are practical reasons, though, for not approaching the subject from this point of view. The line between pathogenic and non-pathogenic organisms is not sharply drawn. Organisms which ten years ago were regarded as harmless, have been since shown to possess, under certain conditions, distinct and intense pathogenic properties. Take for instance the bacillus coli communis, the bacillus prodigiosus and the aspergillus fumigatus. Any one of these bacteria I have found, when introduced into the eye, will call forth the most intense inflammation. The investigations of de Schweinitz, Haab, Poplawska, and of myself, go to show that other than the so-called pyogenic cocci are met with which are capable of producing the most intense panophthalmitis. However valuable observations conducted on these lines might be, they would not tell us whether alcohol protects us from a host of other bacteria which under certain circumstances are just as pathogenic as the staphylococci or streptococci. These were my main reasons for not selecting a special organism to test the efficacy of absolute alcohol as a germicide.

Fürbringer* first called attention to the value of alcohol as a disinfectant for the hands. His work has been gone over by Reinicke (loc. cit.), who has added a long series of most exhaustive experiments bearing upon this question of hand disinfection, and he agrees with Fürbringer in attributing valuable qualities to alcohol as a disinfectant for the hands. Reinicke employed in his experiments permanganate of potash and oxalic acid, sublimate soap, carbolic acid, lysol and trikresol, and compared the results obtained with these agents with the results obtained by disinfecting the hands with alcohol, and his conclusions were as follows: After first washing the hands for five minutes in hot water, using soap and a nail brush, then following this by scrubbing them from 3 to 5 minutes with 90 per cent. alcohol. He [could render] almost always absolutely free of germs. He says finally that the quickest disinfection that can be gained [is to scrub] the hands for five minutes in alcohol. His results were confirmed in the main by Kronig.† Ahlfeld was [a warm supporter of this]

observers differed in some points as to the exact action of alcohol.

Reinicke thinks that the alcohol in taking up the fat takes up the bacteria which are on the hands, and thus the bacteria can readily be washed away (*abgespült*).

Krönig is of the opinion that alcohol, from its dehydrating and astringent power, changes the skin so that the bacteria are held fast in the shriveled epidermis, and in this manner that they are rendered inactive.

Ahlfeld, however, believes in the germicidal power of alcohol and submits this test: Thirteen people were made to wash one of their hands for three minutes in hot water, using soap and a brush, at the same time the finger-nails were trimmed and cleaned. The hands were then rinsed in sterile water. Ahlfeld then removed some of the dirt beneath the finger-nails with a small splinter of wood, and dropped the latter into bouillon. Another finger-nail was treated in the same manner, and the piece of wood was dropped into a small glass containing ½ ccm. of alcohol. The piece of wood was always small enough to be completely covered by the alcohol. The same individuals were then required to repeat the cleansing process with the other hand, but instead of using soap and water, the hand was scrubbed for one minute in alcohol, and inoculations were made from the finger-nails in the same manner as in the first series. The results were as follows: In those cases where the cultures were made from finger-nails which had been washed in soap and water, colonies were present in every instance but two; while in those cases where the alcohol was employed as the cleansing agent, the tubes remained sterile. In the twelve cases where the infected particle of wood was allowed to remain in the ½ ccm. of alcohol for two days after evaporating the alcohol and filling the vessels with bouillon, the latter were found to be sterile after a certain length of time. These tests certainly indicate that alcohol possesses germicidal power.

Schill and Fischer* found that when tuberculous sputum was mixed with alcohol in the proportion of five parts of the latter to one of the former, the bacilli were rendered inactive, as was shown by inoculation experiments. Yersin† found that pure cultures of the tubercle bacilli were destroyed by five minutes exposure to the action of absolute alcohol.

I might add that Green of Birmingham, England, has recently repeated the experiments of Reinicke and failed to confirm them, but his experiments are very few in number and his work is not yet completed. His communication appeared in the Deutsche med. Wochenschrift for June 4th.

As I remarked before, I have been unable to find any experiments bearing upon the efficacy of alcohol as a disinfectant for instruments.

The scheme followed by me in these experiments was as follows: A porcelain-lined tray ten inches long, two inches deep and five inches wide was first sterilized by dry heat. The instruments were then taken from the case and laid in the tray. Squibb's absolute (98–99$\frac{9}{10}$ per cent.) alcohol was poured on the instruments till they were completely covered, and then the tray was covered with a sterilized top. The instru-

ments were allowed to remain in from a period ranging from fifteen to forty minutes. Only once, though, did they remain in the extreme limit; this was in the first series, where a great many instruments were sterilized at one time, and necessarily the last instruments taken from the alcohol had been immersed for a much longer period, namely, forty minutes. Agar tubes were used for the inoculating medium. Each instrument was taken from the alcohol with a pair of long forceps (which had been sterilized by holding them in a flame), and after being plunged once in sterilized water it was then pushed down into the agar. I may say here that each tube was stabbed at least three times, and the majority of tubes were stabbed five or six times, so that every portion of the instrument which would be likely to come in contact with the eye in an operation was rubbed against the culture medium. The instrument remained in contact with the agar from 20–30 seconds, which is longer than the knife remains in contact with the eye in the operation for cataract. The tubes were then placed in the thermostat at the temperature of the human body and allowed to remain for at least three days.

Fresh alcohol was of course used at every sterilization of the instruments. I have divided these experiments into three series. The first series consisted in the inoculation of one hundred tubes with eye instruments which had been sterilized in the way described. The following instruments were sterilized:

Graefe's cataract knives.....	7
Fixation forceps	6
Iris forceps..................	4
Iris knives	4
Lereich's forceps........	1
Desmarre's pincette............................	1
Canaliculus knives.........	5
Scalpels and bistouries used in lid operations........	12
Strabismus hooks	6
Lid retractors	4
Foreign body needles	4
Iridotomy scissors.	2
Discission needles...............	4
Cystotomes..	4
Scoops....................	2
Hooks for tearing capsule..............	3
Beer's cataract knives..	6

And to these seventy-five instruments were added twenty-five nails. These nails were three and one-half inches long and one-eighth of an inch thick. It may be said that the nails had been lying for nearly a year in an open box about twenty feet from where all the autopsies of the Johns Hopkins Hospital are made, and it is almost certain that they were in consequence infected, and doubtless many of them with pathogenic bacteria.

Out of one hundred tubes inoculated in this manner there were five infections. It matters little as to the nature of these infections, for, as I have said before, the probabilities are that almost any if not all bacteria when introduced into the eye-ball will cause inflammation, so that I did not concern myself

* Mittheilungen aus dem K. Gesundheitsamte, Bd. II, 1884.
† Ann. de l'Institut Pasteur, t. II, 1888, p. 60.

as to the properties of the bacteria found in the five infected tubes further than that three of the growths looked as though they were air bacteria, from the fact that they were more or less colored, and cover-slips showed that they were very gross. One of the organisms somewhat resembled the staphylococcus albus, but I am of the opinion that it was too large.

I confess that I was surprised at the result, for I thought that I would get more air infections, and also that the bacteria present on the nails at least would withstand the action of the alcohol.

Another more crucial test was then made: Seventy-five other nails were taken from the same box, and, as in the first instance, they were sterilized by allowing them to remain from fifteen to thirty minutes in absolute alcohol. Instead, though, of simply stabbing the agar, the nails were pushed into the agar as far as they would go and allowed to remain there. The tubes were then placed in the thermostat for three days. Nine infections resulted, or, in other words, nine tubes had growths in them. Five of these growths were almost certainly the result of infections which occurred after the nails had left the alcohol ; two of these five were mold.

It is proper to say that all these experiments were made in the Pathological Institute, and furthermore in two rooms adjoining the autopsy amphitheatre. The conditions, then, for obtaining sterile tubes, or rather the conditions for testing the disinfectant properties of alcohol, were not favorable. It is not improbable that had these experiments been made in a room freer from chances of accidental infection from the air, that I would almost surely have gotten a greater number of sterile tubes. As it was, the results were surprising, especially in the case of the nails, and for reasons stated above.

I have often heard the remark made that eye instruments, from the manner in which they are kept, are not so apt as are other instruments to be unclean. This is probably so, but it is no excuse for relaxing antiseptic precautions in eye operations. In order to ascertain how many instruments in a given number were clean, that is to say bacteriologically clean, I made the following test with fifty instruments taken at random from my own case of instruments and from the hospital case. Some of the instruments had been used the day before and others not for a week previously. After use the instruments are usually dipped in warm water and then wiped with a soft linen rag and returned to the case. Instruments which had been treated in this way were taken, as I have said, at random from the case and plunged several times into agar tubes. Fifty experiments were made in this series, and in sixteen cases the tubes remained sterile. It is certainly surprising that so many sterile tubes followed these inoculations, and while this series shows that the measures we adopt for cleaning our instruments immediately after an operation possess decided advantages, it also goes to show that the majority of instruments, even when treated with our usual care, are infected. I made no examination of the infected tubes.

Thinking that a fitting conclusion to this work would be to ascertain the effect of absolute alcohol upon the pyogenic bacteria, I made the following experiments, fifty in number. Fifty eye instruments were first sterilized by heat and then infected with a pure culture of the staphylococcus albus in the

following manner : A platinum loop was passed into the tube containing the growth of the staphylococcus albus, and gently drawn across the latter and withdrawn, and rubbed over that part of the instrument which is brought into contact with the eye. The instruments were then placed in a tray (which had been sterilized by heat) and one-half a pint of absolute alcohol was poured over them. Twenty minutes were allowed to elapse and each instrument was taken out with sterilized forceps, and that part which had been infected was plunged several times into an agar tube. The results were as follows : Forty-three tubes contained pure cultures of the staphylococcus albus. As to the seven tubes: one was sterile, one was infected with a large micrococcus, one contained a mold, another the bacillus subtilis, and the other three tubes contained bacilli, which were characterized by their very large size and by the luxuriance of their growth, and probably were air bacteria.

These results, to say the least, would seem contradictory when compared with the results of the experiments recorded in the first part of this paper, experiments which pointed to the undoubted value of alcohol as a disinfecting agent. We must consider this fact, though, in this connection, that when we infect an instrument with an organism in pure culture the infection is exceptionally, and I might say unnaturally, virulent, or in other words, that no instrument which has been infected accidentally by exposure to the various conditions surrounding us in every-day life could be so septic as the instrument infected artificially or infected in the manner described in the last series of experiments. The organisms are present in far greater numbers and they exist in their purity. Such a condition is practically never met with. The chance infection which happens to everything which is exposed for any length of time to the air is of the mildest character, even when the organisms are pathogenic, as compared to the infection with an organism in pure culture.

It is not unlikely that in the first and second series of experiments some of the instruments were infected with pyogenic bacteria, but these bacteria were present in too small numbers and under conditions too unfavorable to withstand the action of alcohol.

It is evident that the alcohol in the first and second series was adequate for disinfecting purposes, but it is equally true that alcohol is totally inadequate for disinfecting instruments which have been infected with the staphylococcus albus in pure culture, and this might contraindicate our relying upon absolute alcohol for disinfecting instruments which had been used in operations when the pyogenic organisms are present in great numbers, as in the case of panophthalmitis.

CONCLUSIONS.

1st. That a given number of eye instruments, 1/3 in the majority are infected by exposure to the air.

2nd. That absolute alcohol would seem a somewhat hesitant for instruments infected under the conditions which ordinarily surround us in every-day life. This conclusion seems warranted by the results obtained in the first and second series of experiments. Attention must be called to the fact, too, that in the second series the nails were all without

a doubt infected, and it might be said that they had been exposed to conditions which, to say the least, were extraordinarily favorable for infection, so that this series, I think, is strongly suggestive that alcohol possesses disinfectant properties of no little value.

3rd. That the septic character of instruments infected with a pure culture of staphylococcus albus is not altered by exposure for twenty minutes to the action of absolute alcohol.

I may add that the alcohol employed in these experiments was Squibb's absolute alcohol, which is supposed to have a strength varying from $98\frac{1}{2}$ to $99\frac{9}{10}$ per cent. This is the grade of alcohol which I use in operations.

PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS HOSPITAL MEDICAL SOCIETY.

Meeting of February 3, 1896.

Dr. FLEXNER in the chair.

Generalized Melanotic Sarcoma.—Dr. BLUMER.

Dr. BLOODGOOD.—As I remember the clinical history of the patient from whom the specimens came, it was as follows: An old lady, some 70 years of age, presented herself to the dispensary last August, with a pedunculated tumor in the right axilla. The tumor was perhaps 3 or 4 cm. in diameter and its pedicle perhaps 2 cm. long, but not larger in diameter than the finger. It seemed to be a characteristic benign tumor. There were no palpable glands in any part of the body and no pigmentation in any part of the skin, although she had had a pigmented pedunculated wart in this region of her body for a great many years. The growth was removed by Dr. Nassau under cocaine. She came back in two months with enlarged glands in her right axilla and three darkly pigmented bodies on the skin near the scar of the primary operation. These glands were excised and they proved to be metastases from a melanotic sarcoma. Later the supraclavicular glands enlarged and were removed, and also showed metastases within two weeks. After the removal of these glands in the neck and axilla metastases appeared in the skin all over the body. This has been the second observation that we have made in the hospital of the sudden appearance of these nodules. The interesting features of the case were the benign appearance of the primary tumor, with no evidence of its infiltration through the pedicle into the axilla, and the sudden appearance of the metastases.

Dr. BLUMER.—The autopsy was made over 48 hours after the patient's death, so that the body was not perfectly fresh. There were, however, no marked signs of decomposition. The site of the operation in the upper part of the chest was fairly clear, but in the axilla extending to and involving the right breast was a solid mass of new growth which in spots showed pigmentation. This mass was about the size of a fist. The surface of the body, particularly of the chest and abdomen, was covered with small nodules, varying in size from that of a pea to that of a large bean. Some of them were attached to the skin, others were not. Some were pigmented, some were not. None of them were very darkly pigmented, the pigmented ones being rather light brown in color. There were very few metastases in the skin over the back and extremities; none, if I remember correctly, on the arms and legs. On cutting into the abdominal muscles they were also found to con-

tain small metastases, some pigmented, others non-pigmented. The muscles of the back likewise contained a large number of pigmented metastases. The peritoneal cavity contained a moderate quantity of fluid, and both layers of the peritoneum were studded with tumor metastases varying in size from a miliary tubercle to a large bean. The most marked metastases in the peritoneum were in the dependent parts, particularly in the pelvis, over the bladder and around the appendix. It seemed almost certain in this instance that these were metastases due to transplantation, that tumor cells had been free in the peritoneal cavity and had gravitated to the lowest part and become affixed there. The parietal layer of the pericardium contained no metastases, nor did the heart muscle itself. In the visceral layer of the pericardium were two or three pigmented metastases not larger than a pea. On the surface of both lungs just beneath the pleuræ were quite a large number of metastases, most of them small, and the substance of the lungs also contained similar ones. In all these situations the metastases varied both in size and color. The liver contained but a single metastasis, which was only found after prolonged search. The adrenals both contained small metastases, as did also the kidneys and spleen. There were no metastases in the bladder beyond those on the peritoneal surface. The uterus was also free as far as we could make out. In the right ovary was a nodule about the size of a pea. The intestines showed numerous metastases on the peritoneal surface, particularly along the mesenteric attachment, and a few metastases were present in the mucous membrane of the rectum, and in the mucosa here and there throughout the intestines. There were one or two small nodules in the pancreas. The thyroid gland was normal on the left side, but the right lobe was considerably enlarged and hemorrhagic. Outside the hemorrhagic area, which occupied the center, was quite a large area of tumor metastasis presenting the same character as the metastases elsewhere. The periosteum of one of the ribs, the 7th or 8th on the right side, and the pericranium in the right parietal region both contained small metastases. The one in the pericranium penetrated some distance into the parietal bone, but did not pass into the cranial cavity. The dura was entirely free, but there were numerous metastases in the pia-arachnoid, most of them of small size.

The brain showed a considerable number of metastases. They looked very much like small cysts with dark contents in the brain substance, but on cutting into them they were found to be pigmented metastases, and here the pigment showed up much better than in other parts of the body. A great many of the metastases were situated in the cortex. There were also

numerous metastases throughout the brain substance. There was one moderately large one in the right crus of the cerebrum and one of similar size in the right lobe of the cerebellum, and several scattered around and through the gray ganglia at the base.

The bacteriological examination simply developed the fact that the patient had a general staphylococcus infection, which was probably the immediate cause of death.

There are several points of interest in this case. In the first place the distribution of the metastases was of interest. The places in which metastases are rare and in which they occurred in this case are in the genital organs (right ovary), in the pancreas and in the thyroid gland. A most curious clinical feature is that notwithstanding the extensive involvement of the brain there were absolutely no signs of brain involvement during life. It was noted after death that the right pupil was much larger than the other.

An interesting feature of this class of tumors concerns the melanin which causes the coloration of the tumors, and the origin of this melanin. Does it come from the blood directly, or is it a product of cell activity? As far as I know there is nothing to prove that it comes from the blood. Iron has never, with possibly one exception, been found in the pigment, although this does not absolutely exclude a blood origin, as in malaria we know that the pigment, which does not contain iron, comes from the blood. It seems probable, however, that the pigment in these cases comes from some secretory activity of the cells themselves.

Another point of interest in these cases is the changes sometimes found in the urine—the so-called "melanuria." In the urine, sometimes immediately after voiding, sometimes not until later, there appears a dark pigment. Such urine is found to contain a substance called melanin, but it is not the melanin that gives the dark color to the urine, but some other substance excreted at the same time. The melanin has been isolated, but when tested does not give the reaction. The substance found in the urine is not present solely in melanuria, but also in cases where there is an excess of indol.

Specimen of Adeno-Carcinoma of Pancreas.—Dr. Blumer.

This case came into the medical side with a diagnosis of brain tumor. The man had several symptoms of tumor of the brain, some inco-ordination and double choked disk, but no definite paralysis. On careful examination he was found to have a definite abdominal tumor in the median line suggesting an enlargement of the retroperitoneal glands. I do not know that a flat-footed diagnosis was made during life, but it was suggested that it was perhaps a primary tumor of the pancreas. The autopsy was made 24 hours after the death of the patient. He was much emaciated and jaundiced. There were no metastases to be made out externally. On opening the abdomen the liver was found much enlarged, and there was a very large mass occupying the median line in front of the spinal column, and a large mass in the left flank. The parietal peritoneum was free from metastases. The visceral peritoneum showed a few metastases over the intestines, and one rather interesting metastasis over the appendix vermiformis. This metastasis over the appendix had a cir-

cumference about that of a dime and had completely obliterated the cavity of the appendix. It had evidently grown in from the peritoneal side and pushed the walls of the appendix together, as the sections demonstrate.

The pericardium in this case showed metastases from a direct extension from the bronchial glands. The heart muscle was the seat of one metastasis, in the left ventricle. There were a large number of metastases on the pleuræ and in the substance of the lungs. The bronchial glands on the right side had grown directly into the right bronchus, and there were numerous tumor nodules projecting into this.

The liver weighed some ten or twelve pounds. It contained a very large number of metastases which were distinctly umbilicated and had all the characteristics of carcinoma metastases. The common bile duct was entirely obliterated, being included in the large mass which lay in front of the vertebral column. The gall bladder was very much dilated and extended a hand's breadth below the margin of the liver. The right adrenal gland was entirely replaced by a mass of tumor substance not very much larger than the normal adrenal. In the place of the left adrenal there was a tumor mass about the size of a fœtal head at term, and no sign of adrenal substance. This mass had grown directly into the left kidney, in which, beside this growth, there were a number of metastases about the size of a pea. There were similar small metastases in the right kidney. The spleen was free from metastases, as were the other organs, with the exception of the lymph glands and the cerebellum. The peripancreatic glands were very much enlarged and formed a mass the size of a cocoanut, which lay in front of the vertebral column. No trace of the pancreas could be found; it had been entirely replaced by the tumor mass. No trace of it could be found microscopically.

The meninges showed no metastases, nor did the cerebrum, but springing from the dura lining the right posterior fossa of the skull and compressing the right lobe of the cerebellum, there was a tumor about the size of a pigeon's egg. This did not directly compress anything beyond the cerebellum. This, of course, accounted for the cerebral symptoms which the man had during life

It seems to me that the most interesting point in this case is the fact that both the pancreas and the adrenals were entirely thrown out of function without definite symptoms resulting, the retro.... The man, so far as had been made out, had certainly had no symptoms of Addison's disease during life, and the urine had been free from sugar. Of course there have been a number of cases of Addison's disease reported in which there was absolutely no disease of the adrenals; and again, there have been cases of total destruction of the adrenals in which there were no symptoms of Addison's disease. There have likewise been cases of pancreas involving all the pancreas with new growth without any diabetic symptoms. The question arises whether or not the tumor cells arising from these different organs can take on any of the functions of the organs from which they grow, whether they can keep up [some] internal secretion of the organs which is necessary for the preservation of health. The microscopical appearance of the tumor suggests that it arises from the pancreas. It is an adeno-carcinoma. According to the present understanding of

metastasis, the cells of the tumor occurring in the adrenal should have taken on the character of pancreatic cells and not of adrenal cells, in which case the internal secretion of the adrenals would have been entirely lacking. The question whether in such a case the cells in the pancreatic tumor and in the adrenal tumor secrete the substance normal to the cells of each of these organs is one which needs further investigation.

DISCUSSION.

Dr. FLEXNER.—The example of generalized melanotic sarcoma presented by Dr. Blumer has many points of interest. I wish to add a word regarding the pigments of these growths. It is at least probable that this pigment has the same origin as that present normally in the skin, hair, choroid coats of the eye and substantia nigra of the brain. Until the chemical nature of the normal pigments is more fully investigated and the melanin of this class of sarcomata obtained in a purer state than has been hitherto done, it will not be possible to state definitely what their relation is. We are comparatively well informed concerning the origin of certain of the pathological pigments, and indeed, although less fully, of their chemical composition. We find in given cases no difficulty in referring certain pathological pigments to the bile and others to the blood. Among those derived from the blood are at least several quite well characterized kinds which are yielded by the coloring matters of the red blood corpuscle—hæmatoidin, a definite chemical body hæmafuscin, less well defined, being devoid of iron ; and hæmosiderin, a chemical complex which contains iron in a readily demonstrable form. The dark pigment found in the blood, organs and parasites themselves in malaria and to which the name "melanin" is also applied, differs chemically, according to Carbone, from the pigment of melanotic sarcomata.

The pigment in these tumors is deposited in smaller part within the tumor cells than in the interstitial framework of the growths. Where the quantity of coloring matter within the tumor cells becomes considerable the cells tend to degenerate, and thus it happens that areas occur which apparently consist of pigment only. The color of the latter varies considerably, and in certain tumors or in some metastases of otherwise dark tumors it is of a light brown or almost yellow color. So far as we are informed at present the pigment is produced—autochthonously, if you please, by the tumor. However, other views have prevailed at different times. Schmidt has drawn attention to the circumstances that a small portion of the pigment in nearly all melanotic sarcomata gives the reaction for iron, that the pigment is present in the connective tissue septa as well as in the tumor cells, that, further, at times there is considerable pigmentation of organs at a distance from the tumors, and he has used these facts to support the idea that the pigment may be formed elsewhere, and after partial loss of the iron reaction be transported to and deposited within the tumor. He thinks that he has found additional support in the observations of Wagner of the existence of masses of pigment in the heart and kidneys independent of tumor formation in cases of melanotic sarcoma of the skin associated with numerous actual metastases, and of Oppenheimer, who noted in melanotic skin sarcoma dis-

coloration and pigmentation of the skin, mucous membranes, serous membranes and adipose tissues. A more probable explanation of the iron-containing pigment is that it is derived directly from the transformation of the hæmoglobin of the red blood corpuscles, as actual hemorrhages are not uncommon in these tumors.

The chemical analyses of the dark pigment (melanin) have yielded results somewhat at variance with one another. Iron has been detected in it (Eiselt, Nencki-Oppenheimer, Mörner, Dressler) by some and missed by others (Virchow, Berdez, Nencki). Hence the question of a direct blood origin of the pigment is more or less still a disputed one. An interesting observation has been made by Berdez and Nencki and by Mörner, who found in melanin a large percentage of sulphur, in some instances exceeding 10 per cent. Even this observation has been variously interpreted as proving and as disproving on the one hand origin from the blood, and on the other autochthonous formation. Finally Joos has conceived that the sarcoma cells produce the pigment from the colorless albuminous bodies of the blood plasma. The conclusions which have been arrived at by Abel and Davis (The Journal of Experimental Medicine, 1896, Vol. I., No. 3) in their painstaking study of the pigment of the negro's skin and hair are as follows: The pigment isolated from the containing granules contains only the merest trace of iron—so little, in fact, that it must be considered when entirely pure as free of iron. They further conclude, from the results of their work, that the pigment is not a derivative of hæmoglobin, but probably is ultimately derived from the proteids of the parenchymatous juices.

NOTES ON NEW BOOKS.

Ueber die Beziehungen der Leucocyten zur Bactericiden Wirkung des Blutes. By MARTIN HAHN, Assistant at the Hygienic Institute at Munich. Munich, 1895, Oldenbourg, pp. 1–42.

In this monograph of Dr. Hahn's presented to the K. Ludwig-Maximilian University, pro venia legendi, a series of investigations are reported regarding the relations of the leucocytes to the bactericidal action of the blood. The article opens with a discussion of previous work on the same subject. The objections made by Metschnikoff to the views advanced by Hankin and Kanthack are considered, and the researches of Denys and Havet, and of Vaughan and McClintock, are referred to. Hahn's work follows directly upon some experiments previously made by Buchner. He injected Aleuronatbrei into the pleural cavity of rabbits and obtained from them after 24 hours, blood serum and defibrinated blood, as well as the pleural exudate. The latter was frozen and quantitative bactericidal experiments made with it. He found like Schuster that the exudate rich in leucocytes far exceeds the serum in bactericidal activity, due to the increased amount of labile bodies present in it, bodies which probably have their origin in the leucocytes. He made further experiments with isolated leucocytes, proving that the addition of a salt-solution extract of leucocytes to ordinary blood serum definitely increases its bactericidal powers. An interesting exception to this rule was the fact that cholera bacteria appear to resist markedly the action of leucocyte fluid obtained by means of Aleuronatbrei. This the investigator attributes to two causes : (1) the presence of small amounts of aleuronatbrei diminishes the bactericidal power of the serum, and (2) the

serum after the destruction of the alexines is not favorable for the development of comma bacilli.

Further experiments were made with histon blood with the object of determining whether the bactericidal activities depend upon decomposition products or upon actual secreting products of the leucocytes. In histon blood, in contradistinction to defibrinated and coagulated blood, the leucocytes are preserved in good condition, and it was found that in it or its plasma the same bactericidal activity was developed as is characteristic of the defibrinated blood or serum of the same animal. Phagocytosis was excluded inasmuch as the plasma, freed from cells, was just as active as the blood containing leucocytes. Hahn concludes, therefore, that the bactericidal activity of the serum does not depend upon products resulting from the destruction of the leucocytes, but much more upon substances representing actual secretions of these cells. The article closes with some interesting considerations upon the relation of the substances under consideration to natural immunity and to therapy, and some emphasis is laid upon the possibility of increasing them artificially within the body. Those interested in this field of investigation will be well repaid by a perusal of the original article.   L. F. B.

DIABETES MELLITUS.*

This work of Dr. Weintraud's has its special interest, not so much from any light it throws on the real local disturbance in diabetes, as from its dietetic point of view, and the interesting problems it brings up in relation to the processes of digestion in this disease. The value of the fats in the nourishment of diabetic patients is especially considered, the extent of their absorption, their influence on the destruction of albuminoids and on the excretion of sugar. The author proves that patients who have diabetes, but who are for the time being passing no sugar in their urine, may be kept in a state both of nitrogenous and body weight equilibrium, with the same amount of albumens and fats as a healthy person, and that they do not need a food which represents a higher caloric value than that required by a normal individual. He shows that from 200 to 300 grammes of fat can be eaten daily by patients with diabetes, and that this amount of fat is well borne, and that even with a diet consisting of 78 per cent. of fat the nitrogenous equilibrium of the body is well maintained.

Vogt's theory that the metabolic processes in diabetes are not diminished by any means, but rather increased, is thus substantiated.

There is, as has long been known, an increase in the nitrogen excreted in diabetes. Further, in order to keep up a nitrogenous equilibrium on a diet consisting largely of albuminoids, there must be an increased destruction of them, dependent on certain changes of the destroying cells and tissues. It has been thought by some physiologists that this increased destruction of the albuminoids represents a peculiar metabolic disturbance in diabetes; but in Vogt's laboratory it has been shown that the destruction of albuminoids occurring in patients with diabetes is not different from that in healthy men of like weight, when their food was free from carbohydrates. This leads Vogt to think that the quantitative changes in the metabolism of diabetes are not alone due to the presence of sugar, but also to the increased destruction of albuminoids. The presence of sugar is due to the fact that it is incompletely consumed by the organism, as a result of some true disturbance of function, and not to any diminution in the amount of oxygen taken in, for this in itself is merely secondary to the real disturbance. We know, moreover, that in diabetes the oxidation processes are not deleteriously influenced, for to consume fat is no easier than to consume carbohydrates.

*Bibliotheca medica: D. H. Dr. Wilhelm Weintraud. Untersuchungen über den Stoffwechsel in Diabetes mellitus und an die letzt. — Therapie der Krankheit. 1893. Verlag von Dr. G. Fischer & co., Cassel.

The body heat is maintained, when the carbohydrates are eliminated from the food, by an increased destruction of corresponding quantities of fat and albumens, and Dr. Weintraud proves that in his cases only the same amount of albuminoids and fats was required as would have been required by healthy individuals of like weight living under similar conditions, to maintain both a nitrogenous and body-weight equilibrium. His theory is that the excretion of sugar is due to failure of the fermentative breaking up of the sugar molecule which is necessary before it can be attacked by oxygen. The enormous excretion of urea in diabetes shows that the breaking up and oxidizing of the albuminoids goes on in the ordinary way, and this is also true of the fats. In diabetes the source of heat is mainly the combustion of the fats, whereas in health the carbohydrates being much more easily oxidized, the heat is chiefly derived from their combustion. Such are a few of the points which come under consideration in the first half of the article.

The author then proceeds to take up the question of the value of fats. He shows that in almost all his experiments the fat has been absorbed in a completely satisfactory way. It has been experimentally proved that when the pancreas is extirpated, unemulsionized fats are not absorbed, and emulsionized ones in but sligh degree. But fat does not always occur in the stools of patients who have pancreatic disease, and Lancereux, describing certain cases of diabetes mellitus, as " diabète maigre," which he attributes to disease of the pancreas, says that in these cases the absorption of the albuminoid constituents of the food was not in any appreciable way modified by the addition of large masses of fat to the nourishment. That the consumption of fats actually does work to the advantage of keeping up the nitrogenous equilibrium in healthy individuals has been proved by other investigators, and Dr. Weintraud shows that this is also true in certain cases of diabetes, though at first, if the amount of the albuminoids ingested is large, there may be an increase in the excretion of nitrogen in the urine, but this condition does not last long and soon the nitrogenous equilibrium is restored. As yet there is no satisfactory explanation for this reaction. As regards the comparative value of fats and carbohydrates in saving the expenditure of albuminoids, all that need be said is that a given quantity of carbohydrates represents a higher caloric value than a like quantity of fats, but all that it is necessary to do is to give such a quantity of fats as would equal the caloric value of a given quantity of carbohydrates and in this way we could accomplish the same end, the saving of albuminoids, equally well.

In considering the question of the influence of fats on the excretion of sugar the author proves that no excretion of sugar, worthy of mention, is ever caused through increase of the fats in the food. At times small quantities of sugar are excreted, when change is made from a diet poor in fats to one rich in fats, but this increase is merely temporary.

The next point of interest which comes under discussion is whether Seegin's theory that sugar is formed in the liver from fat and albumen is correct, and Dr. Weintraud thinks not. He does not believe that in diabetes mellitus, where it is impossible to use up the sugar, an increase in these fat and albumen changes. If we had an increase in the sugar production in a large amount on the other hand the introduction of albuminoids always leads to an increase in the excretion of sugar. Though patients on an albumen-rich but carbohydrate-free food do not, and Dr. Weintraud's experiments show conclusively that with a fat-free diet fats excreted when some fat was taken with the diabetes there was no increase of the sugar excreted, and even with a fat diet there was apparently an increased destruction of albuminoids; and in addition there was no increased amount of sugar in the urine.

the diet of fats was very large, were so small that they could not be estimated quantitatively, and were never in proportion to the amount of fats given. Had they been larger it might be possible to explain their appearance on the theory that in the combustion of the fats all the oxygen from the blood was used up, and therefore the combustion of the sugar was prevented, but under the circumstances this theory is hardly tenable. It is, however, on this ground that Lichtheim opposes a diet rich in fats, but in his cases the appearance of sugar in the urine may have been due to the large amount of albuminoids consumed. It is with this discussion of the place of fats in the diet of diabetes that the article practically ends, though there are a page or two on what may be called the dietetics of individual symptoms which may appear in the course of the disease.   RUPERT NORTON.

A Manual of Syphilis and the Venereal Diseases. By JAMES NEVINS HYDE, A. M., M. D., Professor of Skin and Venereal Diseases, Rush Medical College, etc., Chicago, and FRANK H. MONTGOMERY, M. D., Lecturer on Dermatology and Genito-urinary Diseases, and Chief Assistant to the Clinic for Skin and Venereal Diseases, Rush Medical College, etc. With forty-four illustrations in the text and eight full-page plates in colors and tints. (*Philadelphia: W. B. Saunders*, 1895. Pp. 8–17 to 618. Price $2.50.)

In preparing this manual the authors have kept in mind the needs of the student and of the general practitioner, hence all matters of controversy have been subordinated to matters of fact.

The book treats of the diseases commonly classed as venereal, viz., syphilis, chancroid and gonorrhœa, and of a few minor affections to which the sexual organs are subject but not necessarily of a venereal origin. The text is illustrated by a few drawings, plates and photographs. Nearly one-half of the book is devoted to a description of syphilis. It is to be noted that a departure has been made from the usual custom of dividing this disease into primary, secondary, and tertiary stages, which are more or less artificial. The division rests upon clinical types, which are arranged according to the severity of the constitutional involvement, into four well-marked classes: 1. Benignant syphilis with mild and transitory symptoms; 2. Benignant syphilis with relapsing or persistent symptoms; 3. Malignant syphilis with relapsing or persistent profound symptoms; 4. Malignant syphilis with relapsing or profound lesions that are ultimately destructive.

The descriptions are given in a clear and entertaining style, and the definitions are exact and comprehensive. One is well repaid in glancing over the pages of this book, for the matter, although condensed, covers the field of venereal diseases completely.
                    J. W. L.

Obstetric Accidents, Emergencies and Operations. By L. CH. BRISLINIERE, M. D., LL. D. 8vo, pp. 381. Profusely illustrated. (*Philadelphia*, 1896, *W. B. Saunders.*)

This well-printed book is not a treatise on midwifery nor a manual of obstetrics, but is intended for the use of the practitioner when thrown upon his own resources and unable to consult more elaborate treatises upon midwifery. The style is clear and forcible and the directions given are judicious and well considered. It can be commended to those who desire a practical handbook to help them meet pressing emergencies.

A Manual of Anatomy. By IRVING S. HAYNES, Ph. B., M. D., Adjunct Professor of Anatomy, New York University. Pp. 680. 134 half-tone illustrations and 42 diagrams. (*Philadelphia*, 1896. *W. B. Saunders, Publisher.*)

This manual, which is more one of dissection than of general anatomy, as its title would seem to imply, is an example of careful study and thorough work. The illustrations are for the most part original with the author and in many instances are reproductions of photographs made from careful dissections; some are good; more are blurred and lacking accurate definition, probably owing to hopeless defects in the original photographs. The author's plan of reproducing actual dissections is worthy of much praise, and it is to be regretted that the negatives were not more carefully taken. Many of the diagrams illustrating the text are printed in two colors and are admirable aids to the text. The index is carefully compiled, and access to the vast amount of technical knowledge contained in the book is readily afforded by it. The book should be in the hands of surgeons and students of anatomy.

SPECIAL COURSES FOR GRADUATES IN MEDICINE GIVEN BY THE JOHNS HOPKINS UNIVERSITY AND HOSPITAL. CHANGE OF DATE.

With the completion of the organization of the Johns Hopkins Medical School, it has been found necessary to give the *courses intended especially for physicians* hereafter during the months of May and June, instead of at an earlier period of the academic year as heretofore. This new arrangement applies to the academic year beginning October, 1896. The courses of instruction for the undergraduates who are candidates for the degree of Doctor of Medicine are open only to these undergraduates. Physicians, not candidates for a degree, are admitted only to the special courses which begin May 1, 1897, and which continue for two months. Those who have had the requisite training and desire to undertake advanced and research work in the various laboratories, may be admitted at any time during the academic year, at the discretion of those in charge of these laboratories.

It is believed that the new arrangement as to the time of holding the graduate courses will prove to be more convenient than the former one to the majority of those desiring to take the courses.

These courses are intended especially to meet the requirements of practitioners of medicine. They include laboratory courses in pathology, bacteriology and clinical microscopy, and practical instruction in the hospital and in the dispensary in medicine, surgery, gynecology and the various special departments of practical medicine and surgery.

The detailed statements concerning these courses, the fees and all other necessary information, will be found in the published Announcement of the Special Courses for Graduates in Medicine, which will be sent upon application to the Johns Hopkins Medical School, Baltimore.

BULLETIN

OF

THE JOHNS HOPKINS HOSPITAL.

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PATHOLOGICAL REPORT.

By SIMON FLEXNER, M. D.. Resident Pathologist, The Johns Hopkins Hospital, and Associate Professor of Pathology, Johns Hopkins University.

The patient whose history I wish to bring before you this evening, I saw through the courtesy of Dr. Hiram Woods, who referred her to me on October 17, 1895. Her history in brief is as follows:

Miss Blank, æt. 30, school-teacher. She complained of difficulty in walking, of deafness and difficulty in seeing.

Family history: father died of Bright's disease, one brother has epilepsy, eight brothers and sisters died in infancy.

Personal history: patient is the youngest of 13 children. She was always a delicate child, although she suffered from no especial illness. She played very little with other children, as she easily became tired. During her school life she had several nervous breakdowns, and when 18 was thought by a prominent physician of this city to have delicate lungs. Miss Blank has been engaged in teaching for nine years, but has lost more or less time every year. At different times during this period

her voice has failed her for ten days or two weeks, but not, however, during the last three years. She has fainted several times. Three years ago she began to complain of very severe headache, which was brought on by any excitement, especially laughing. The pain was very severe, but lasted only a few moments; if it had lasted longer she thought she would have become unconscious. These attacks of pain recurred nearly every day until August, 1895, when Dr. Woods gave her glasses, from which she derived some relief. Miss Blank stated that she had at times momentary losses of vision, especially of the left eye, but sometimes of both. She thought that this depended upon whether she was worried or excited. For about a year the patient has had some difficulty in walking; at times she staggered and walked as if she were drunk. Last June, if she walked even a block, the exertion caused a severe headache.

At the time of her first visit to me she said that she walked much better than she did six months before. She complained at times of tremor in the legs.

Other than the headache, she has suffered from no pain, but has had a sensation of tingling in the feet and of numbness in her nose and mouth. Since January, 1895, she has become more or less deaf. She has not complained of double vision, but for a week or two previous there has been noticed a slight jerking of the eyeballs.

She complained of some difficulty in passing her urine, but of no lack of control.

Later, at other times, I learned from her mother and sister that there had been a gradual change in her disposition; they had noticed this for more than a year. She had become fretful and unreasonable and hard to get on with.

The examination, at her first visit, gave the following result: patient speaks usually in rather a slow manner, but at times rapidly and loud. The speech is not scanning and her articulation is distinct.

Eyes: there is a well-marked rotary nystagmus, which is increased in looking towards the left. Muscular movements of eyes are normal except that lateral movements seem to tire her; she is unable to hold her eyes either to the right or left for any length of time. Pupils are round and equal, and they react to light and during accommodation. They dilate equally in a dim light. The fields of vision are slightly contracted; colors are seen in the normal order.

Vision practically normal.

Ophthalmoscopic examination shows a well-marked neuro-retinitis in both eyes.

During the examination the patient on several occasions complained that she had become blind; this blindness lasted for one or two moments. She was quite deaf in her left ear, being unable to hear a watch on contact. In the right ear she heard fairly well. Objectively, sensation was undisturbed in face. The facial muscles, those of the tongue and the muscles of mastication all acted normally. Muscular strength of arms was good and there was no tremor. She wrote fairly well, although she says that at times her writing is very poor and that her hands often shake. Deep reflexes are active. In standing there is a tendency to sway, and if the eyes be closed she staggers and if not steadied would fall to the left. Her walk is unsteady and tumbling, somewhat like that of a drunken man.

The muscular strength of legs is good, no noticeable tremor; the deep reflexes are active.

These symptoms suggested strongly the presence of a brain tumor, and that was the diagnosis, although the possibility was entertained that the case might be one of multiple sclerosis combined with hysterical symptoms.

She came to see me, October 18th, complaining of a very severe headache. On October 25th, while walking and feeling as well as usual, she fell on the street. She went home and went to bed, and after that time she never was able to walk at all. When she got up she would sway, and it seemed to be impossible for her either to stand or to walk. Soon after going to bed she complained of very intense headaches, sometimes darting down the back of the neck and behind the ears. These headaches were controlled fairly well by hot applications and a capsule containing 5 grains of phenacetin and $\frac{1}{4}$ of a grain of codeia, repeated when necessary. The hearing in her right ear gradually became less and less acute, and this loss of hearing was accompanied by very annoying ringing in the ear. In the early part of December she became quite deaf, being unable to hear any sound, either by bone conduction or in any other way. Dr. Woods examined her again and determined that the deafness was due to some disturbance in the nervous mechanism. Her vision seemed to be not quite so acute, although she could still read. At this time Dr. Woods noticed a beginning atrophy of the optic nerves. There was no paralysis of the eye muscles, but it seemed to be very difficult for her to move her eyes up or down, or in or out. She would not look to one side or the other for any length of time. There was no ptosis. The nystagmus varied from day to day. After she became deaf, all communication was carried on by means of writing. As she became blind we had to write in larger and larger characters, and finally vision left her entirely. After this the only communication was by signs; she would ask questions that could be answered by "yes" or "no," and we would press one or the other hand in answer to the questions. Pain became less toward the last. She had two or three attacks of vomiting, and in the last two weeks had several slight convulsions, and on one or two occasions she complained of a sensation as if she were falling out of bed. A little more than two weeks before she died she developed a complete right facial paralysis. She never knew that her face was paralyzed, and I did not make an examination by electricity, but I am confident from the character of the paralysis that it was peripheral. She had a little fever every now and then and her pulse got a little more rapid. She finally died quietly, being perfectly conscious up to within half a minute before her death, when she spoke and tried to give her attendants some directions.

After she went to bed there was no doubt that the patient suffered from a tumor of the brain. Dr. Osler saw her shortly afterward, and he confirmed the diagnosis of brain tumor. There was very little to assist in localization at this time. The patient had a peculiar unsteadiness while standing, suggesting cerebellar trouble, and she had deafness in one ear, the other ear not having become markedly deaf. As that ear began to get deafer and deafer, remembering some of the later investigations as to the association of the posterior pair of the corpora quadrigemina with the central tract from the auditory nerve, and considering also the facts brought out by Nothnagel in his well-known article on diagnosis of tumors of this region, I believed that the growth involved the corpora quadrigemina, and when the patient became quite deaf I felt still more confident that that was the case. When the right facial paralysis developed it was not easy to explain it, but I thought that it might be a pressure symptom.

Ever since Nothnagel in 1889 called attention to the symptoms which tumors of corpora quadrigemina produced, a great deal of interest has centred around such growths. The localizing characteristic of tumors in such a position he stated as being an uncertain swaying gait, especially when it occurs as the first symptom combined with an ophthalmoplegia affecting

both eyes but not quite symmetrically. He says nothing about the loss of hearing in such cases.

In the *Archiv für Psychiatrie* for 1894 there are three articles following each other on tumors of the corpora quadrigemina. It is interesting to note the different points of view taken by these authors. The first article is by Bruns, of Hannover, in which he endeavors to establish the points in diagnosis between tumors of the corpora quadrigemina and those of the cerebellum. He had a case of each in which the symptoms were very similar, in fact they both presented the combination of symptoms which Nothnagel had considered as characteristic of tumors of the corpora quadrigemina.

Bruns concludes that this complex of symptoms is not to be relied upon in making a local diagnosis between the cerebellum and the corpora quadrigemina, but he thinks, however, that the order in which the symptoms occur and their relative prominence may give some indication. Thus, if the ophthalmoplegia is prominent and the first symptom, and the sixth pair of cranial nerves be not involved, and the ataxia develop later, the corpora quadrigemina are implicated; whereas, if the ataxia occurs first and is prominent, and the ophthalmoplegia includes the sixth nerve, the tumor is more probably in the cerebellum. He does not mention loss of hearing as a localizing symptom.

The second article is by Ilberg, in which he reports a case of gumma in the corpora quadrigemina. The case is reported fully, but he makes no general remarks.

The third, and for our purpose the most important article, is by Ernst Weinland; he reports a case and considers the relation of the posteria corpora quadrigemina to disturbances of hearing. Including his case, he was able to collect nineteen cases of tumors of the corpora quadrigemina, in nine of which there were disturbances in hearing, and he thinks that if the examinations had been made more thoroughly there would have been fewer negative cases. Weinland concludes that nerve deafness is an important focal symptom, especially if taken in connection with cerebella ataxia and ophthalmoplegia. When the deafness is unilateral the growth is on the opposite side.

Gowers also states that double nerve deafness should suggest disease of the corpora quadrigemina. In Bruns' case no note is made in regard to the hearing, although it is stated that the left tympanic membrane was defective. The case was of a boy two and a half years old. In Ilberg's case there was marked deafness on the right side, which he explains by slight infiltration of round cells in the right auditory nerve. The tumor, however, was in the left posteria corpora quadrigemina, and so agrees very well with Weinland's proposition. Dr. Barker has kindly consented to give you the result of the latest investigation in regard to the central course of the eighth nerve, and Dr. Flexner will demonstrate the tumor which was found in the case which I have reported.

REMARKS ON THE ANATOMICAL RELATIONS OF THE COCHLEAR AND VESTIBULAR NERVES.

DR. L. F. BARKER.—Our newer knowledge of the anatomy of the rhombencephalon and mesencephalon, and of the origin and course of certain of the nerves connected with these, throws so much light upon the functions of these parts and yields so many data from which conclusions may be safely drawn in clinical cases, that a few remarks concerning certain of the points with particular reference to the cochlear and vestibular nerves, may not be out of place in connection with this interesting report which Dr. Thomas has just made.

The nerve formerly called the eighth cranial, acoustic, or auditory nerve, has, since the investigations of Duval, Bechterew and Forel, been known to consist, in reality, of two nerves which are anatomically separable and functionally, almost, if not entirely, independent, the *Nervus cochleæ* and *Nervus vestibuli*. Both these nerves, as far as we at present know, carry only centripetal impulses, and the bipolar cell-bodies of the neurones of which they are made up are situated entirely (with possibly a few exceptions) outside the main body of the central nervous system, in ganglia which embryologically correspond to the ganglia on the posterior roots of the spinal nerves. The ganglion for the N. cochleæ is the ganglion spirale; that for the N. vestibuli is the ganglion vestibulare.

The Cochlear Nerve.—The dendrites,* or, if preferred, distal axones, of the cell bodies in the ganglion spirale grow out to the organ of Corti and end there free among the cells of that organ, one bundle of them corresponding to the nervus saccularis going to the saccule. The impulses beginning in these processes pass through the cells in the spiral ganglion, are then transmitted by their axones which run in the cochlear nerve to the junction of the medulla with the pons. At the point where the N. cochleæ arrives in the central nervous system, its constituent fibres enter into relation with certain definite masses of grey matter, in which are situated the cell bodies and dendrites of large numbers of sensory neurones of the second order.

Through the work of Flechsig and his pupils, and particularly through the researches of the brilliant young Leipzig investigator, Hans Held, we have, of late, been made tolerably well acquainted with the exact relations of the peripheral neurones of the acoustic path to those situated in the grey matter inside the central nervous system. The two most important groups of the sensory neurones of the second order belonging to the cochlear nerve are (1) the nucleus N. cochlearis dorsalis (nucl. tuberculi acustici) and (2) the nucleus N. cochlearis ventralis. The fibres of the cochlear nerve entering the latter nucleus, in part end there, in part give off collaterals and go on further directly into the trapezoid body, coming into relation with the superior olivary nucleus and the nucleus of the trapezoid body of one or both sides. The fibres may end in these nuclei, or some of them may, as is shown in this diagram, constructed according to Held's description, pass on through the lateral lemniscus to masses of grey matter situated higher up in the central nervous system. Similarly those axones of the cochlear nerve reaching the dorsal nucleus of this nerve, may end in it by free branching among the cells or their dendrites, and pass out by a

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* The fibres of the cochlear and vestibular nerves peripheral to the ganglia, like those of nearly all peripheral sensory neurones, are medullated and histologically indistinguishable from axones, though embryologically and physiologically they may perhaps be looked upon as dendrites.

into the *striæ medullares*, those bundles of medullated fibres which make up the transverse white bands visible on the floor of the fourth ventricle about its middle, spoken of sometimes in the text-books as the *striæ acusticæ*. The constituent fibres of the striæ medullares decussate for the most part in the middle line and dip down into the depth to become involved in the superior olivary complex, the impulses they bring finding their further course forwards, in all probability, along the fibres of the lateral lemniscus.

The axones from the cell bodies situated in the ventral cochlear nucleus go to make up a large part of the trapezoid body (corpus trapezoideum) on each side. Many of the axones of the neurones situated in the dorsal cochlear nucleus also dip down mesial to the corpus restiforme, and come into relation with the superior olivary nucleus and lateral lemniscus of the same or of the opposite side. The fibres of the lateral lemniscus run forward through the pons and reach the level of the inferior colliculi of the corpora quadrigemina, in which many of the fibres terminate by free endings; some of the fibres of the lateral lemniscus run also into the grey matter of the superior colliculi to terminate among the dendrites of the nerve cells situated there. A large number of fibres pass beyond the corpora quadrigemina in a bundle lying along with the brachium quadrigeminum inferius, mesial and ventral to the pulvinar, and dorsally and laterally as regards the red nucleus of the tegmentum; this bundle (the direct acoustic cortical path of Flechsig and Held) becomes joined by a bundle from the medial geniculate body and passes directly through the internal capsule to a definite cortical area in the temporal lobe. This area, which corresponds to Flechsig's *Hörsphäre*, is represented mainly by the gyri temporales transversi, especially by the anterior, and so is largely hidden in the wall of the fossa Sylvii, reaching the external surface of the hemisphere only at that part of the gyrus temporalis superior which is in contact with the gyri transversi, *i. e.* its middle third.

In the lateral lemniscus in addition to the fibres passing from below upward, there are numerous axones which pass from above downward, belonging to neurones in the various grey nodules of its path, so that the grey masses of the corpora quadrigemina, the nucleus of the lateral lemniscus, the superior olivary nuclei of the two sides, the nuclei of the trapezoid bodies together with the primary nuclei of termination of the cochlear nerve, are provided with conducting paths as shown in the diagram, going in both directions, so that the manifold interchange of impulses among these nuclei is fully provided for.

One point of especial interest is the absence of any direct connection of the cochlear nerve with the cerebellum, this nerve being quite different from the vestibular nerve in this respect, as I shall point out in a few moments. The demonstration of the important connection of the auditory path with the inferior colliculi of the corpora quadrigemina, we owe to Flechsig, who further asserts that the fibres of the brachium quad. inferius pass to the auditory centre in the temporal lobe chiefly by way of the medial geniculate body.

The cochlear nerve becomes connected with the superior colliculi of the corpora quadrigemina in at least two ways:

(1) through fibres which pass from the lateral lemniscus directly into the superior colliculi, and (2) through fibres which pass from the superior olivary complex through the fasciculus longitudinalis medialis (posterior longitudinal bundle) to the nuclei of the oculomotorius nerve.

The superior olives are connected with the nucleus N. facialis and with the nuclus N. abducentis. An anatomical substratum for the acoustic eye reflex can thus be easily constructed, inasmuch as the superior colliculi of the corpora quadrigemina have to be looked upon as the centres directly in control of the movements of the eye muscles.

The development of the superior olivary nucleus in the animal series appears to stand in a more or less direct relation to the acuteness of the hearing of the animal. It is small in man, and Flechsig in his lectures amusingly remarks, "Wir spitzen auch die Ohren nicht." It is stated that animals which have no cochlea also lack trapezoid body, lateral lemniscus and the inferior colliculi of the corpora quadrigemina.

The Vestibular Nerve.—The distal processes of the neurones, the cell bodies of which are situated in the ganglion vestibulare, pass to the ampullæ of the semicircular canals and to the utricle. The central processes or axones, which are thicker than those of the cochlear nerve, unite to form a thick bundle which runs along with the cochlear nerve, but is, even macroscopically, as a rule, distinguishable from it. On entering the central nervous system the vestibular nerve passes mesially as regards the corpus restiforme, though laterally as regards the tractus spinalis nervi trigemini, and probably comes into relation with the nucleus nervi cochlearis ventralis only through collaterals given off in passing. There are four distinct nuclei of termination (or of reception) of the vestibular nerve, three of them corresponding to the grey matter in the floor of the fourth ventricle known as the *area acustica*. Of these three masses of grey matter the upper one is known as the nucleus N. vestibularis superior (Flechsig, Bechterew), often spoken of in the German text-books as the main nucleus (Hauptkern). The lower nucleus is called the nucleus N. vestibularis medialis (Schwalbe), the "hintere acusticus Kern" of the Germans, while the large-celled nucleus of Deiter's, situated laterally and between the two, is known as the nucleus N. vestibularis lateralis. In addition to these three nuclei of reception a fourth has to be considered, namely the mass of grey matter adjacent to the bundle of fibres of the vestibular nerve known as its descending root (ascending root of Roller); this nucleus is called the nucleus N. vestibularis spinalis.

In these four nuclei are situated the cell bodies and dendrites of sensory neurones of the second order belonging to the vestibular paths. Impulses can arrive in these nuclei besides from the vestibular nerve from numerous other sources; thus for example the nucleus N. vestib. lateralis receives numerous axones from the nucleus fastigii of the other side of the cerebellum. The large axones from a portion of the cells in Deiter's nucleus pass down into the anterior and lateral columns of the spinal cord, so that it is not impossible, as has been suggested, that Deiter's nucleus may represent a way station between the cerebellum and the cord and perhaps, through the anterior horn cells, the muscles.

The axones of the sensory neurones of the second order in

these vestibular nuclei pass in large part to the medial lemniscus of the opposite side and to the cerebellum; some of them enter the fasciculus longitudinalis medialis. Those which go to the cerebellum may be divided, according to Held, into two groups: (a) a bundle passing from the nucleus N. vest. superior, ending in the central grey masses of the cerebellum; and (b) bundles of fibres passing from the nucleus N. vest. medialis along with the corpus restiforme into the cerebellum. The contrast between the relations of the vestibular nerve and those of the cochlear nerve to the cerebellum is thus seen to be striking. Flechsig believes that the axones from the vestibular nuclei which enter the fasciculis longitudinalis medialis pass forward to come into relation with the eye-muscle nuclei, possibly through the superior colliculi of the corpora quadrigemina. It is his opinion that the impulses passing along these fibres may have to do with the maintenance of the eyes in certain positions. Professor Osler has just referred to the fact that in diseases of the semicircular canals or of the vestibular nerves there may be an accompanying nystagmus, and we now have the promise, at least, of the anatomical explanation of this symptom.

It is generally conceded that the impulses coming from the semicircular canals play an important rôle as regards the position and equilibrium of the head, and the connections of the vestibular nerve with the cerebellum are of especial interest in this regard.

In the case before us a remarkable symptom-complex has been presented. According to Dr. Thomas and Dr. Woods, the patient has suffered from headaches, giddiness, deafness, disturbances of equilibrium, disturbances of vision, interference with the movements of the eye muscles, including nystagmus, vomiting, convulsive seizures, right-sided facial paralysis, with all which there has been complete retention of consciousness. In connection with the more recent knowledge of the structure of the rhombencephalon and mesencephalon, such a group of symptoms is of very great significance, and I shall be extremely interested in learning the results of the pathological examination which Dr. Flexner has made.

Pathological Report by Dr. Flexner.

I was invited by Dr. Thomas and Dr. Woods to perform the autopsy in this case. The subject was a well nourished young woman. The examination was limited to the brain, as consent was not obtained for a complete autopsy.

The soft tissues of the scalp were lax and the skull-cap was of moderate thickness. The dura mater was entirely free from adhesion to the calvarium. The superior longitudinal sinus contained fluid, dark blood. Internally the dura mater adhered to a tumor mass which projected on the left side into the inferior fossa of the skull. The tumor measured 6x4x4 cm. and was attached to the median side of the left lateral cerebellar hemisphere, its growth being directed forwards. The firmest attachment of the tumor was to the dura forming the internal periosteum of the skull in the floor of the inferior fossa, and when separated from this, the latter presented a shaggy and torn appearance.

The tumor had exerted pressure laterally upon the left corpora quadrigemina, the right being but little if at all involved

in the compression. There was no growth directly into these parts. The tumor had also flattened the left half of the pons almost to the median line. The left crus cerebri was pressed upon, particularly on its superior surface, and the left superior peduncle of the cerebellum partially flattened. The middle and right lobes of the cerebellum were free from the tumor and the effects of direct pressure.

Upon section of the tumor and left cerebellar hemisphere, the former was seen to extend throughout the entire thickness of the cerebellum and to be continuous both with the cortical and medullary portions. In external appearance the tumor was not so unlike the cerebellum, being distinctly lobulated. It had a strikingly opaque yellow color, and in consistence was firmer than the cerebellum itself, being somewhat moveable independently of the latter.

The central portion which made up the greater part of the tumor was mottled red and grey, while the cortex alone exhibited the yellow color already referred to. Within the tolerably soft tumor, firmer nodules the size each of a bean existed. These were most numerous nearer the cerebellar connection than elsewhere.

The tumor growth extended beneath the dura where it covered the petrous portion of the temporal bone. The bone itself was, however, quite smooth.

The seventh and eighth nerves on the left side were pressed upon and much flattened. Those of the right side appeared small and atrophied. All the ventricles of the brain were dilated and contained an excess of clear fluid.

Under the microscope the tumor varied less in its different parts than might have been supposed from the variations in its gross appearances. The softer parts were œdematous, and the elements composing the tumor more or less widely separated by fluid. The tumor itself was very cellular, the connective tissue framework being rather scantily developed. A few thick bands existed in the denser part of the growth, to which, indeed, these may have owed in part their greater consistency, and within these calcareous concretions of small size were occasionally found. The chief cells of the tumor were of an epithelioid type, the form being for the most part an elongated oval. These cells were gathered into groups, often in whorls, separated by thinner and thicker strands of even more elongated cells with nuclei of the same general character as those in the enveloped cells. The amount of intercellular substance between the enveloping cells might be little or much, and in any case it was homogeneous and not fibrillated; or it might be absent altogether. Thus it happened that quite distinct alveoli came to be formed, and rarely the cells occupying an alveolus were flat and scale-like and closely approximated. Smaller cells of the lymphoid type were also seen, forming independent round or irregular groups, but more often giving rise in the neighborhood of vessels to elongated masses. Blood-vessels were in certain situations quite abundant, but they were not distributed with any regularity through the tissue. In some places the tumor was exceedingly vascular. It should be said that painstaking search for processes such as are found associated with the cells in gliomata failed to reveal any such. From this description the diagnosis of alveolar sarcoma seems justified. The tumor is believed to have

sprung from the cerebellum, although no other evidence for this belief than its position and attachments are at hand.

DR. THOMAS.—It is seen from the report of autopsy that the tumor involves the left lobe of the cerebellum, pressing upon the corpora quadrigemina, but not involving them by actual ingrowth, and that the auditory nerve of that side is in very close connection with it. This relation may account for the early deafness in the left ear, although it is difficult to understand how the facial nerve on that side could have escaped. We are forced to believe, unless a careful microscopical examination shows some central changes, that the deafness in the right ear and the paralysis of the right side of the face were distant pressure symptoms, a very unsatisfactory explanation.

The diagnosis of tumor of the corpora quadrigemina was based on the combination of double nerve deafness, the cerebella ataxia, and the weakness of the eye muscles, although there was no actual paralysis. The absence of ophthalmoplegia was explained by the supposition that the tumor was in the posterior rather than the anterior corpora quadrigemina. I believe that under similar circumstances the same diagnosis would be justified, although the possibility which is ever present when a local diagnosis has been made, of the disease being somewhere else, would be still more prominent.

JOHN BELL, SURGEON.

By WALTER B. PLATT, M. D.

(Read before the Johns Hopkins Hospital Historical Club, May 11, 1896.)

One of the best men of his profession of the latter part of the eighteenth and the early part of this century was the man who signed himself John Bell, Surgeon. He was an eminent teacher without a university, a surgeon for years without a hospital, and a teacher with enthusiastic pupils in a school made mostly by his own efforts.

Had he followed the example of many notable Scotch surgeons of to-day and gone to London, where he had plenty of admirers, he would have received more honor than others of his townsmen who remained in Edinburgh and succeeded in gaining the attention of those who, with singular blindness, passed him by.

Bell, the second son of the Rev. William Bell, was born in Edinburgh on the 12th of May, 1763, and received his education principally at the High School of his native city. His early liking for medical studies was very evident, and as soon as possible he entered as a pupil of Alexander Wood, a well-known surgeon.

He became a Fellow of the Royal College of Surgeons of Edinburgh, and in 1780 was Lecturer on Anatomy and Surgery. He then made a large number of dissections and founded a museum, an "extra-university enterprise." His brilliant success was a direct result of his zeal and activity as a teacher. Charles Bell, his younger brother, assisted him in his work for several years, and later edited his great work on Surgery. Bell's "Anatomy of the Human Body," a portion of which I have the pleasure of showing you to-night, passed through many editions and was translated into German. A rapid improvement in the surgery of arteries followed his work on anatomy, in which these were particularly described.

In his "Nature of Wounds" he gave a clear exposition of the advantages of securing first intention union, something just then coming to be regarded as desirable, as distinguished from the recent practice of dilating and separating the edges of a wound by means of tents and all manner of substances to prevent rapid healing.

For twenty years he was the leading surgeon of Edinburgh, during which time he had a long controversy with Dr. Jas.

Gregory, the Professor of Medicine in the university of that city. The result was most unfortunate for Bell. Although he only replied when attacked, his defense was so violent as to cause a reaction against himself. It ended in the limitation of the number of attending surgeons to the Infirmary to six, of whom Bell was *not* one. Gregory at this time was severely censured by the College of Physicians for violation of the truth.

In his "Letters to the Medical Profession" Bell makes a long and labored criticism of Gregory and others of his opponents (as was the fashion of that day, and until within thirty years not uncommon in our own country), in which italics and large capitals were freely employed. If the quotations from Jas. Gregory are correct, they certainly show him up in a bad light, as a disagreeable and undesirable person. As a specimen, upon his appointment to the position of Censor to the College of Physicians, Gregory says: "Since they will have me for a censor, they shall have me for a censor; I can assure them with perfect truth I would rather act as a whipper-in to a herd of swine pursued by a legion of devils, than a Censor to a College of Physicians, or to any society of men who needed such censorious admonition as at present it is my duty to give them."

In another part of the book Bell dwells upon the importance of much dissection in order to properly qualify a surgeon, and scoffs at those who try to make a surgeon by experience alone, and without a previous thorough anatomical training.

"To ally Anatomy more closely with Surgery, to connect the art more intimately with the science from which it flows, seemed to me a task as yet imperfectly accomplished, and yet of the very highest importance. The study of Pathology contributes not only to make the surgeon intrepid, bold and skilful, but to keep alive those sentiments which give a peculiar value to his best and most sacred duties. The continual reference of every symptom and suffering to certain physical changes going on within the body, begets a lively sensibility for the feelings of the patient while he lives, or to his fate while his life is in danger."

He speaks of the horrors of a surgical operation by an unskilful surgeon and with poor assistants, a situation much worse than to-day, when an anæsthetic allows more time for clumsy helpers to do their part. Some members of the profession seem to have understood the art of advertising almost as well as men of our time who cannot wait for the well-earned reputation of good work. Bell scores a brother surgeon, Benjamin Bell, who for some months advertised a mild cure for stricture as opposed to the use of caustic. This was well contrived by writing a book on the subject and advertising the work in the public prints, a thin device to secure private practice often used in our day.

John Bell speaks in terms of well deserved contempt of the effort to teach surgery or anatomy to a class most of whom are one hundred feet away from the demonstrator, instead of compelling each one to work out his own salvation by careful work on the cadaver. Surgical anatomy as we understand it, was not systematically taught before the time of Bell.

While Bell spent some of his valuable time in personal attacks on such members of his profession as he deemed worthy of satire and exposure, there is little doubt that in the main it was richly deserved. Those were pre-eminently days of personality and vituperation, and Bell in his philippic against Gregory says, " I neither mistook my bird nor missed my shot." The latter, as we have seen, tried (and with success) to exclude Bell, the leading surgeon of Edinburgh, from the Infirmary.

In at least one way his exclusion from the Infirmary proved a blessing to the profession, for Bell soon set about writing his " Principles of Surgery," in three volumes, a most remarkable and interesting work. Men of that day did not hesitate to say a good thing now and then in the course of their strictly surgical teaching. His work is a monument of learning, representing pretty well the best surgical ideas up to his time, as well as his own, original and acquired. In editing a subsequent edition of the work, his brother Charles speaks of the correctness and importance of the principles taught by his brother, as well as of his admirable qualifications for teaching. To give an extract:

" Experience is observation founded upon previous knowledge . . . The present mode of teaching anatomy tends little to excite this spirit of observation. He will have little sympathy with the pains or sufferings of his patient who does not reason on what is going on within the body, who does not watch incessantly the symptoms indicating change, whether toward health or disease; and feel more fears and anxieties than his patient can imagine, and see dangers of which his friends cannot be conscious. Such reasoning repeated from day to day is truly experience."

David Williams, in a memorial to the College of Surgeons against the Managers of the Edinburgh Infirmary, referring to the proposed limitations of the number of attending surgeons to six, whereas there were formerly a much larger number, says, "A surgical case is very different from a medical one. Surgery depends more upon particular facts, and medicine more upon general reasonings. Any surgeon therefore can observe a matter of fact that falls under his notice, but it is not every physician who is capable of entering into a long process of reasoning on a difficult case." Again he makes an observation which will apply very well to a number of hospitals in our own day: " Upon a deliberate consideration of this case it is apprehended that there is another party whose interests have been entirely overlooked, that is the public."

This appears to have been the case in the exclusion of Bell from the Infirmary, for, hospital or no hospital, he enjoyed the confidence of the public to the extent that he was the leading surgeon of Edinburgh for twenty years.

In the preliminary discourse to his Principles of Surgery, in speaking of the education and duties of a surgeon, Bell writes: " Such is the natural horror at blood, and the vacillations and difficulties of the surgeon himself when anything so daring as a dangerous operation is to be done; and such are the increasing and anxious inquiries of friends, that operations, though the least part of our profession, strike a deeper interest into the public mind than the daily cures we perform. Operations usurp an importance in surgical education which they should not naturally have. Operations have come at last to represent as it were the whole science, and a surgeon, far from being valued according to his sense, abilities and general knowledge, is esteemed excellent only in proportion as he operates with skill." He concludes: " Respect yourselves, deserve well of your country, and all those who are around you will be sensible that you are deserving; refrain from complaints, which will but harden your enemies and disgust your friends."

Like many another good man, Bell was one of those who could give excellent advice to others which he was unable to apply to his own case.

Bell's Surgery contains a vast amount of interesting information to any student of the history of medicine. He refers to the abuse of tents to prevent primary union of wounds, and we may as well notice that the old surgeons, without any knowledge of the true principles of aseptic or antiseptic surgery, *did* look upon primary union as a thing to be desired, and achieved it in a certain proportion of cases. He refers again to the sympathetic cure of wounds, so-called, by practicing upon a bloody towel, a stain, or upon a weapon. All this might of course be done at a distance as well as on the spot by the charlatan who advocated this sort of thing. He says further that one of the chief of medical schisms arose about the time of Paracelsus upon the question, " Whether it was necessary that the moss should grow absolutely in the skull of a thief who had hung on the gallows, and whether the ointment while compounding was to be stirred with a murderer's knife."

A more practical matter from our standpoint was the treatment of apoplectic attacks, which was apparently considered to be the province of a surgeon. After reviewing the condition in which we find the patient, in a most graphic way, he says: " Raise your patient with a sitting posture, have him supported behind; let his legs hang over the side of the bed; bleed from a large orifice in one or both jugulars; expose him, especially if the weather be sultry, to a stream of cool air by ... ... the chamber; sprinkle his face with cold water." " Cut him and his painfulness or mark his face change; but if the stertorous breathing

relax, if the pulse become frequent and soft, if he swallow more freely, if his groans seem less oppressed, if he raises his eyelids at last and appears to know his friends, if he begins to shudder as if feeling the cold, and to move his limbs, you are going to save your patient."

In a historical sketch by Strothers, upon the Edinburgh Anatomical School, we are told, referring to Bell, "Among numerous students was a young man, remarkable for his keen eye, intelligent countenance, and small stature. It struck this youth that although the professor then in the chair was an excellent teacher of anatomy, the application of anatomy to surgery was quite neglected."

He seems never to have recovered from his exclusion from the university, and although his private practice was extensive it did not atone for the loss of a public position. "Bell was not only the reformer of surgery in Edinburgh, but the father of it." "A bold and dexterous operator, he combined all the qualities of a great surgeon to an extraordinary degree." "He was master alike of the head, hand, tongue and pen." That he was a grateful and warm-hearted man, the dedication of his "Anatomy of the Human Body" to Rutherford witnesses. In this he says:

"To Daniel Rutherford, Professor of Medicine and Physician to the Royal Infirmary, Edinburgh.

Sir,—In presenting this book of plates to one who is so well able as you are to judge of their defects, I ought to add some value to the offering by declaring the motives of it. It is a mark of gratitude for the friendly care with which, in company with my worthy master, you watched over me during a long and dangerous illness. Perhaps there can be no higher compliment betwixt medical men than this confidence in time of sickness, and surely if I may judge by my own feelings, nothing can be more grateful than the remembrance of

kindnesses bestowed at such a time.—May your skill be long useful to your fellow-citizens, and may it be always valued as I value it. I am, Sir, with respect,
          Your friend and humble servant,
                    John Bell."

He married later in life than most of our profession, since he was no less than forty-two years of age when he wedded the daughter of a retired physician.

In 1816 he was thrown from his horse, and in consequence of disability he went to Italy the year following, where he engaged in the study of art in its various aspects. The results appeared in his "Observations on Italy," edited by his friend, Bishop Standford. Mrs. Bell, in writing a preface to this work after her husband's death, says: "With warm affection and sanguine temper he looked forward with hope that his labor and reputation would one day bring independence, and meanwhile he would give his last guinea to any one who required it. Judging others by himself, he was too confiding in friendship, too careless in matters of business; consequently in the one he was exposed to disappointment, and from the other involved in difficulties and embarrassments which tinged the color of his whole life." John Bell died of dropsy, in Rome, April 15, 1820.

In regard to the impression he made upon those about him, one of his biographers says: "He was impetuous and energetic, and in controversial writings almost violent. He was one of those men who, without achieving great success, leave behind them an abiding impression, and stamp their character in the institutions and thought of the age in which they live. In person he was below the middle height, of good figure, active looking, and dressed with excellent taste. Keen and penetrating eyes gave effectiveness to his regular features, so that his expression was of a highly intellectual type."

CONCERNING NEUROLOGICAL NOMENCLATURE.

By Lewellys F. Barker, M. B., *Associate Professor of Anatomy; Assistant Resident Pathologist.*

The nervous system, as is well known, was formerly described as being made up of nerve cells and nerve fibres. Each peripheral nerve fibre of the cerebro-spinal system consists of an axis cylinder around which is a fatty sheath, and outside this again is another sheath, the neurilemma. Bundles made up of great numbers of these nerve fibres held together by firm fibrous tissue run through the tissues of the body and are known as "nerves." The term "nerve," as originally employed, had reference to the firm, sinewy or tendinous character (Latin *nervus*, Greek νευρον) of these bundles, a quality dependent in reality on the fibrous connective tissue of the bundle rather than upon the really functioning irritable structures within it. The terms "nerve" and "nervous" are now connected in thought rather with the functionally irritable structures.

The relations of the nerve cells to the nerve fibres remained for a long time unknown. The nerve cells occurring in groups within the nerve centres were known to possess branched pro-

cesses, the so-called protoplasmic processes or *dendrites*. Later on it was shown that the axis cylinder of every nerve fibre is always a process—an integral part, therefore—of a nerve cell, though this process is very different in form and probably in function from the other processes (dendrites). It has then been demonstrated that the whole nervous system is made up of units, each unit consisting as a rule of a nucleated cell body with its dendrites, together with one or more axis cylinder processes with side-branches (side-fibrils, and collaterals or paraxones) and end-ramifications. Each of these units inclusive of all its processes is in reality a single cell of the body, quite analogous to a single liver cell, or a single muscle cell, and a very suitable name for the unit would be "nerve-cell" were it not for the fact that this term has been used for decades to indicate only a portion of the unit as mentioned above (viz. all except the axis cylinder) and in many minds would call forth this erroneous idea. It remained, therefore, to find a satisfactory name for the whole nerve unit. Waldeyer
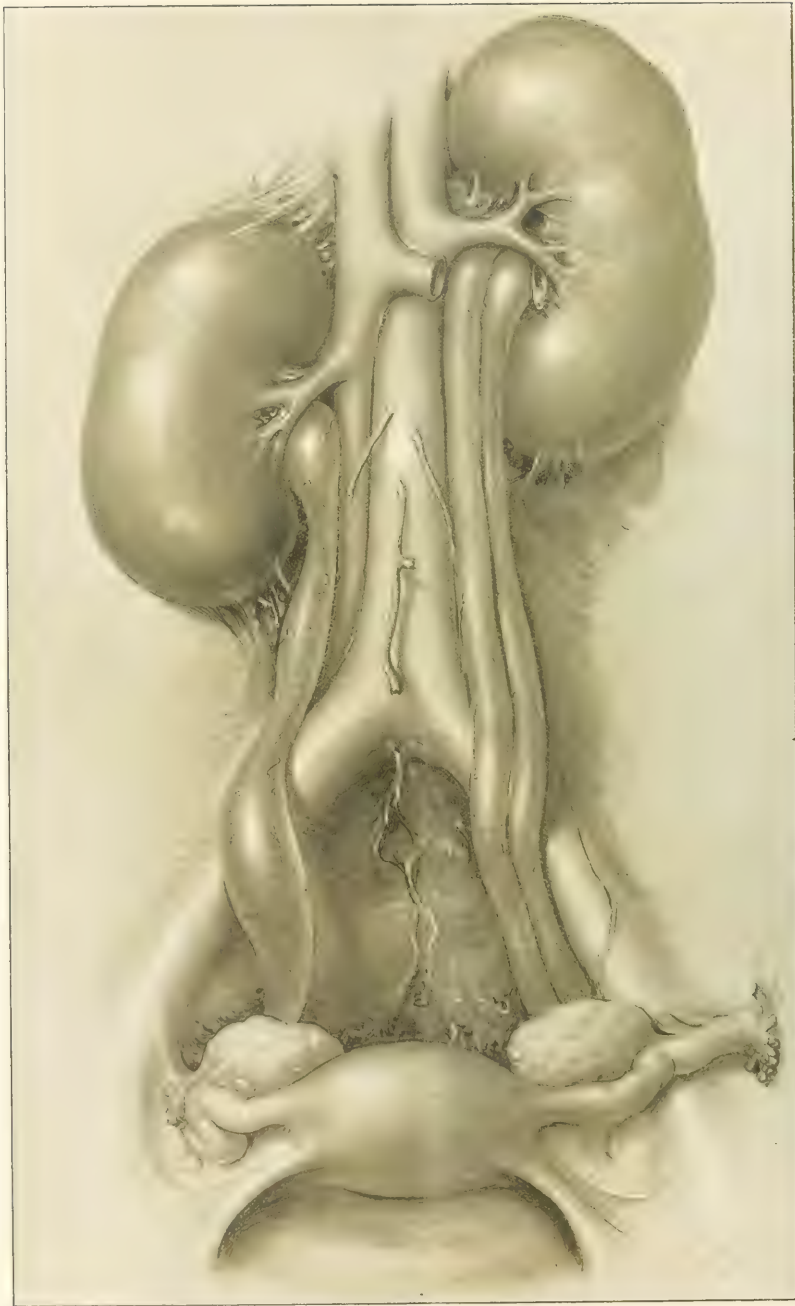
Fig. 1.—Double ureter on the left side with double renal pelvis.   Abnormal position of the right kidney.
Hydro-ureter on both sides.

of Berlin suggested that from the Greek ο νυρών a new German word be coined, *der Neurón* (pl. *die Neuronen*), and the introduction of this term has been of significant influence in making the ideas involved in what is now generally called the neurone-conception of the nervous system generally known and appreciated. The term has been in Germany almost universally adopted by morphologists, histologists, physiologists and clinicians notwithstanding the objection offered by v. Kölliker that the term *ό νυρών* in reality indicates " einen Sammelpunkt vieler Neuren oder Nerven." He has suggested that the word *Neurodendren* or *Neurodendridien* be used instead. Van Gehuchten has adopted Waldeyer's word, spelling it in French *"le neurone,"* and French writers generally employ it. The leading investigators in Spain and Italy have also adopted the same term; so that even if it were etymologically somewhat objectionable, its use has become so general and cosmopolitan that it seems as though we must also employ it in English. Baker's suggestion that we use the term *neure* is a very good one, but the term of Waldeyer has already become too prevalent to be easily supplanted. The question arises, how is Waldeyer's term to be anglicized? Would it be justifiable to bring it into English through the French and to spell it *neurone*, pronounced neurōne, or could it be brought into English directly from the Greek and be so spelled and pronounced? It is especially desirable that this spelling and pronunciation be permissible, owing to the fact that a few writers, among others Schaefer and Donaldson, have employed another word, *neuron* (Gk. το νυρων), to mean the axis cylinder process, a nomenclature which is obviously etymologically faulty and which in my opinion is not likely to become generally popular owing (1) to the existence of a better term for the axis cylinder, viz. axone or neuraxone (Greek άξών), already current; and (2) to the likelihood of its confusion with the word introduced by Waldeyer for the whole nerve unit, a word now in almost universal use in other countries.

For the sake of avoidance of confusion in the bibliography a speedy agreement concerning the nomenclature is certainly highly desirable. I have submitted the question, very much as outlined above, to Prof. B. L. Gildersleeve of the Johns Hopkins University, with a request for aid, which has been courteously and promptly given. Prof. Gildersleeve writes me that v. Kölliker's objection to νυρών will not hold, for it would apply equally well to *παρθενών*, which means "the house of the virgin." He adds, " While the spelling *neurone* is not pleasing, still for that matter the spellings *anode* and *cathode* are just as objectionable, since after the analogy of *method* they should be spelled *anod* and *cathod*, and under the circumstances *neurone* seems to be inevitable." It is a matter of congratulation, I think, that neurologists may thus use the term in English with the sanction of a recognized authority in Greek. If medical and scientific writers will co-operate, we may finally hope to bring about the establishment and maintenance of a uniform international nomenclature.

A COMPLETE DUPLICATION OF THE LEFT URETER FROM THE KIDNEY TO THE BLADDER.

BY OTTO RAMSAY, M. D., *Baltimore, Md.*

The following case, coming to the autopsy table from the gynecological ward of the Johns Hopkins Hospital, is of interest from a rare abnormality of the ureter which it illustrates, being a duplication of the left ureter throughout its entire extent, beginning at the kidney with a double pelvis, and ending in separate ureteral orifices at the bladder.

The patient from whom the specimens were obtained was a woman of 45 years of age. She had been admitted to the gynecological ward suffering with a carcinoma of the cervix uteri, which on examination was found too far advanced for operative help. Death followed soon after her admission, the result of exhaustion. There were no signs of uræmia, the patient passing a moderate amount of urine daily. As no bladder examination had been made before death, there was no suspicion of the condition found at the autopsy.

I cite here only the anatomical diagnosis, and the condition of the kidneys, ureters, bladder and urethra, the remaining portions of the autopsy report being of no interest to us in this connection.

Autopsy No. 813, June 22, 1896.

Anatomical Diagnosis.—Sloughing carcinoma of the uterus, perforation into the rectum. Involvement of the ureters. Hydroureter and slight hydronephrosis. Double ureter on the left side, with double kidney pelvis and two bladder orifices.

Extension of the tumor to the surrounding tissues and infection of the lymphatic glands. Chronic nephritis. Subacute pericarditis. Obliterating pleurisy. Peritoneal cyst attached to the appendix vermiformis.

Condition of the Urinary Organs.—Both kidneys about the same in general appearance; the left is somewhat larger than the right, with its upper extremity 5 cm. above the upper extremity of the right kidney. The ureters are dilated and contain quite clear fluid.

The right ureter is about the size of the index finger; the pelvis of the corresponding kidney is dilated, the calices being deepened, but relatively these parts are dilated less than the ureter.

The whole kidney is very pale, the cortex being uniform in [...] the [...] quite so pale as the cortex.

On the left side the ureter is double. Beginning at the hilum of the kidney by separate pelves, between which there is no communication, the two ureters from here run side by side, bound closely together, [...] the bladder, where they enter at distinct orifices 1.5 cm. apart. They are dilated throughout their whole extent from the point where they are involved in the growth at the cervix uteri to the kidney. Each is about the size of the little finger, had

contains quite clear contents. They show marked contraction where they pass through the growth extending from the cervix, but a probe can only with some difficulty be forced into each ureter from its appropriate orifice.

The mucous membrane of the bladder is beset with fine hemorrhagic points. At the orifice of the single right ureter there is a teat-like projection into the cavity of the bladder, at the summit of which the ureteral orifice is found. This projecting portion of the mucous membrane is firm in consistence and is probably due to a direct extension of the new growth. The bladder is moderately distended with turbid urine. The urethra is congested, but shows no sign of the extension of the new growth,

The accompanying drawings illustrate well the condition.

Fig. 1 shows the two dilated ureters on the left side, from their origin, to the spot where they are compressed by the new growth, also the markedly dilated right ureter. Fig. 2 shows the bladder with the two ureteral orifices and the teat-like projection at the site of the right ureteral orifice.

The condition of complete reduplication has been described by Weigert, Debierre and others, but I found no reference similar to the condition here pictured. In a case reported by Heller (Deutsch. Arch. für klin. Med, Bd. V, Heft 2) there was a hydroureter and hydronephrosis of one portion of a double ureter and double pelvis, the dilated ureter ending as a closed sac in the wall of the bladder; a similar case is also reported by Weigert (Virch. Arch. No. 70, p. 490).

NOTES ON CONGENITAL MOTOR DEFECTS OF THE EYEBALLS (CONGENITAL PARALYSIS OF THE OCULAR MUSCLES).

REPORT OF A CASE OF BILATERAL PARALYSIS OF THE EXTERNAL AND PARESIS OF THE INTERNAL RECTI MUSCLES.*

BY HARRY FRIEDENWALD, A. B., M. D.

Paralysis of the ocular muscles is a subject, of great interest to the neurologist and to the ophthalmologist. The slightest degrees of impairment make themselves very apparent and are readily measured. Affections of the different nerves are separated without difficulty, and the situation of the lesion can often be deduced with exceeding nicety.

For these reasons the paralyses of the ocular muscles have been carefully studied, and various classes of central and peripheral origin have been separated. There is a class of cases which is congenital. Those that have been published were collected recently by Kunn (Deutschmann's Beitraege zur Augenheilkunde, Vol. II, p. 711), and number about seventy-five. They include single paralyses and combined paralyses of all the extrinsic ocular muscles, monolateral and bilateral.

There has been some discussion as to whether these congenital cases form a separate type or belong to the same class as those occurring in youthful persons and young adults, and recognized as acute nuclear paralysis, or what Wernicke terms polio-encephalitis superior. Moebius has taken the latter view (Ueber infantilen Kernschwund; Muench. Med. Wochenschrift, Vol. XXXIX, 1892, No. 2–4).

Kunn, on the other hand, seeks to establish these cases as a separate class, due not to atrophy of the nuclei, but to the non-development or defective development in the embryo of one or more parts of the motor chain from the cortical centres to the muscles themselves. It was with a view of bringing this question before you that I present a case and these notes to you.

Among the cases which I had the pleasure of demonstrating here† last winter there was one of congenital paralysis of the right external rectus muscle, with some impairment of adduc-

tion of the same eye. The usual result of acquired paralysis, namely contracture of the antagonist, was missing. There was also slight enophthalmus.

At the same time I reported two cases very similar to the above. In both of these there was absolute inability to move the left eye outwards beyond the median line. In one there was likewise enophthalmus, with some interference with adduction. In neither of these cases was there contracture of the antagonist muscle. In none of the three cases was there diplopia. In direct vision, all had binocular vision. All of these cases showed the peculiar movements of the eyelids associated with lateral movements of the eyeballs, which was the subject of the paper.

Monocular paralysis of the external recti is the most common form of congenital paralysis.

At the same time I reported the case of bilateral paralysis of the external recti. I have since then been able to study this case much more thoroughly, and shall present him to you.

H. F., aged 19, complained that he was forced to move his head from side to side in reading, and that his left eye was weak. There was no asthenopia, but his eyes became red after reading. At the first examination I could not make out any lateral movement in either eye, a request to look toward either side being followed by a corresponding movement of the head, the eyes remaining stationary. It was for this reason that I was induced to regard the case as one of paralysis of both abduction and adduction of both eyes.

The patient has been examined a number of times since then. Under atropia, a slight degree of hypermetropic astigmatism was found in the R. E. (0.5 Dc Ax 70°). The left eye is amblyopic, V 6/60, which cannot be improved with glasses. There is no movement outwards in either eye. But after numerous trials the right eye tested at the perimeter could with difficulty be adducted to about 45°, and monocularly even to 60°, but it could be held there only a few moments. At the same time the right palpebral fissure became smaller, the left larger than usual. As to the left eye, repeated and very great efforts did not succeed in adduction ex-
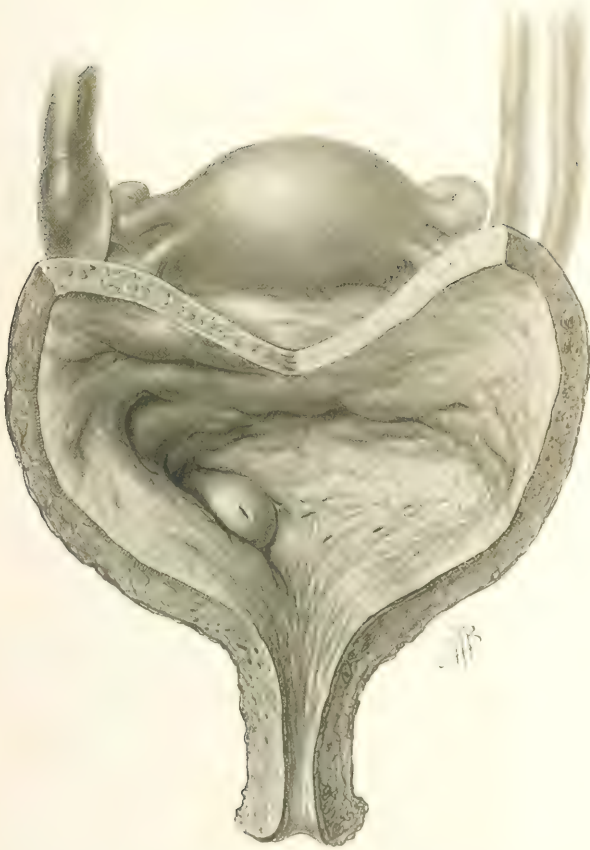
Fig. 2.— Two perfect ureteral orifices on the left side.   Teat-like mass on
the right side with the right ureteral orifice at its summit

ceeding 30° or 35°, and then only for an instant. This likewise resulted in associated movements just the contrary of those described above.

Tested with a red glass before the right eye, there was homonymous diplopia toward either side, but not in the primary position.

With the phorometer there were about 4° of left hyperphoria and 4° of esophoria. His eyes do not appear to be directed perfectly parallel in distant vision.

Examinations of binocular vision resulted in his being able to fuse simple pictures in the stereoscope after a few minutes trial. This, however, is known to be an unsatisfactory test. Tested according to the Lippincott method, binocular vision, or more definitely binocular perspective vision, was shown to be present when the patient looked directly forwards, but not when the object was held on either side. Tested by the most delicate method—Herring's Fallversuch—the patient answered correctly only in about half the trials. This appears to be attributable to the very defective vision of the left eye.

We should therefore conclude that while binocular vision is not perfect, it is present to a certain degree, and probably as great as the relative defect of vision in the left eye would permit of.

The convergence of the eyes has been examined a number of times and is very defective. But the patient appears to converge to within the reading distance. The convergence is mainly due to contraction of the right internal rectus.

Other defects were sought for. Facial paralysis, which existed in some of the reported cases, is not present. There is no mental defect, and the only other peculiarity is great hesitancy in speech. The affection is undoubtedly congenital and was observed very early. (Demonstration.)

In this case let me call your attention to the defective action of both internal recti muscles. This has been commonly observed in cases of bilateral paralysis of the external recti. It is just the contrary of what is expected, namely, contracture. What is still more important is that in many of these cases convergent action of the interni was perfect even though the lateral action was entirely wanting or very defective and difficult.

This is, as Kunn has pointed out, a mark of difference separating cases of congenital paralysis from all acquired cases.

There has been much difference of opinion concerning the significance of the defective action of the interni in these cases of complete paralysis of both externi. Graefe thought that the initiative of lateral movement lay in the externi, and these being paralyzed, the interni failed to act. Kunn and Simon (*Entstehung der Koordinirten Augenbewegungen*, Zeitschr. f. Psychologie, Band XII, p. 102) regard the inability of the interni to perform lateral movements as the result of disuse, no attempts being made by the patient to look toward either side on account of the diplopia that would ensue.

Inasmuch as there was some defect in adduction in two of my three monocular cases, I am inclined to regard this, at times certainly, as a *partial congenital paralysis* of these muscles. When convergence is good, and lateral movement is very defective, we may accept Kunn's explanation. This has given rise to some difficulty in explaining why the internus of the fellow eye is not affected in unilateral paralysis of the abducens, for here, too, movements toward the side of the paralyzed muscle produce diplopia. The difference appears to me to lie in the fact that in these cases there is considerable play for the muscles in all movements between extreme lateral deviation (toward the side opposite to that of the paralyzed muscle) and the median line.

An important characteristic of congenital paralysis lies in

the existence of binocular vision, which was found in all the monocular and binocular cases that I have seen and in many of those reported. There is also absence of diplopia.

Kunn explains the varying positions in which the eyes have been found—parallelism, convergence or divergence—as those naturally assumed by the eyeball in the orbit; and that these vary need not be a matter of surprise, since the different primary positions of otherwise normal eyes are found to vary greatly. The absence of contracture has been noted in most of the cases published and is to be considered as a mark of congenital paralysis.

Concerning secondary deviation (of the normal eye when the affected one is used for fixation) which is almost universally present in acquired paralysis (excepting in very rare cases when the paralysis has existed for many years), we may state that this sign, as Graefe long ago discovered, is always absent in the congenital cases. This is explained by Kunn as due to the fact that no association between the paralyzed muscle and its fellow has ever existed. If, therefore, attempts are made to call the paralyzed muscle into activity there is no impulse sent to the fellow muscle.

Many cases of congenital paralysis of the ocular muscles have had associated with them other congenital defects, such as facial paralysis, unequal development of the two sides of the face, mental disturbances, etc., etc.

Heredity has been a conspicuous factor in cases of congenital paralysis.

Considering the peculiarities of congenital paralysis, Kunn asserts that these cases form a definite class, and he ascribes them, not to fœtal disease or to atrophy of the centres, but to *arrested development*. He calls attention to the cases in which absence or presence of the muscles has been demonstrated in congenital paralysis, and to one (Bernhardt's) in which the centre was found normal. His conclusion is that either of these portions or any others in the motor chain may suffer arrest of development. He therefore discards the term nuclear paralysis and substitutes " congenital motor defects of the eyeballs " (angeborene Beweglichkeitsdefecte der Augen), a term which I think should be adopted until the nature of these cases is more definitely determined.

MALARIAL INFECTION AS A SOURCE OF ERROR IN SURGICAL DIAGNOSIS.

By W. W. Russell, M. D., *Associate in Gynecology.*

The discovery of the hæmatozoa of malaria and the subsequent establishment of their relation to malaria as the definite cause of the disease, has almost excluded the possibility of its being offered as a cause for irregular fevers attending surgical affections. Yet with this definite knowledge of the cause of malaria, we still find in the current literature cases cited with atypical elevations of temperature associated with surgical troubles which are ascribed to malarial influences. Such assertions are inexcusable when a positive diagnosis can be obtained by an examination of the blood. This neglect has led to appalling mistakes, of which an example came to my knowledge a few years ago. A patient presented herself to a surgeon complaining of pain in the lower abdomen, pelvis and back, with chills and fever. Upon examination a mild pelvic peritonitis was found. She was advised to have the tubes and ovaries removed, and submitted to the operation. The patient had a severe chill the next day, followed by a rise of temperature to 107° and collapse. The blood was then examined and found teeming with malarial organisms. The patient eventually recovered, but nevertheless the operator was negligent in not excluding by systematic study of the case the possibility of malarial infection, before performing what proved to be an unnecessary mutilating operation.

My experience during the August and September service in the Gynecological Wards of the Johns Hopkins Hospital was interesting from the number and variety of cases in which malarial organisms were found. The possibility of malaria being superimposed upon various surgical affections was strikingly shown, as well as the dangerous conclusion which might be reached without the positive proof of the presence of the organism in the blood. The experience teaches further that in malarial districts malaria must be always suspected in fevers following operations without an assignable cause.

Some writers have suggested that temperature and pulse charts are valueless during post-operative convalescence. The danger of such teaching is well demonstrated by the following cases, in which the first suggestion as to the true character of the trouble was found on the daily charts.

Case No. 1. Mrs. D. G., age 33. Patient complains of loss of control of bowel. The personal history is negative until 1893, when she had an attack of typhoid fever. This was followed by an abscess around the rectum, and a recto-perineal fistula, which was opened by her consulting physician; since then there has been complete incontinence of the bowel. She has been operated upon twice within the last year for restoration of the sphincter ani without success. She suffers almost constantly from diarrhœa, but the stools do not contain blood or mucus. General health is excellent.

Operation Sept. 9, 1896. The ends of the retracted sphincter, which were separated two-thirds the circumference of the bowel, were dissected out of scar tissue and brought together by silk-worm gut sutures passed deep into the tissue.

Sept. 18. Sutures removed. The sphincter well contracted and apparently holds firmly, but some separation of skin surfaces. There has been no escape of flatus or feces since the operation, and the patient is able to control her bowels for an indefinite period.

Sept. 23. The patient's convalescence has been uninterrupted, the temperature ranging from 98° to 100.4°. This morning a severe chill occurred, and the temperature rose to 103.8°, the pulse during this time not reaching over 84 beats per minute. By 5 P. M. the temperature had fallen to the normal line, and continued so until 10 A. M., September 25, when there was a chill and a similar rise of temperature to 103.6°. The blood at this time was examined and found to contain numerous malarial organisms of the tertian type. Quinine in doses of five grains every five hours was given, and thereafter three grains four times a day until the fifth day following the last chill. After the patient had taken the quinine there was no chill or rise of temperature, and the organisms completely disappeared from the blood.

The patient was discharged from the hospital October 2d, in excellent health, the result of the operation perfect.

The initial chill did not occur until fourteen days after the operation, but during this period there had been a slight daily rise of temperature not reaching above 100°. The wound broke down but slightly. The first suspicion was naturally directed to the seat of operation, but as the condition there did not seem to warrant interference, it was thought advisable to await developments. The chill on the second day suggested at once the blood examination, with the happy result given in the case.

Case No. 2. L. G., age 27. Patient's personal history negative until four days before admission. She was three months pregnant, and had attempted to introduce into the uterus an instrument to produce abortion, but her doctor says that she had introduced it into the bladder instead of the womb. Since then she has had constant pressing pain in the region of the bladder and lower right side, with fever. For four days micturition has been exceedingly painful, and she has noticed that the urine is bloody. There is a great deal of tenderness in the region of the bladder, and the bearing-down pains have grown steadily worse. On examination the patient was determined to be in the third month of pregnancy. The bladder was inspected in the knee-breast position with a 9½ vesical speculum. The entire mucosa was found to be of a deep fiery-red color, bleeding on the slightest touch, and quantities of free blood poured out through the speculum. The foreign body could not be made out on account of the hemorrhage. The urethra was greatly dilated, and easily admitted the little finger. On palpation of the bladder, by passing the finger through the urethra the foreign bodies could be easily felt, but were too large to be extracted. An incision was then made into the base of the bladder and a disintegrated sea-tangle tent was removed. A permanent fistula was established by suturing the mucous membrane of the bladder to that of the vagina.

The patient's temperature from the time of operation to the

thirteenth day had ranged from 98° to 101.2°, at which time there was a decided chill followed by a rise of temperature to 102°, the pulse reaching 136 beats per minute. By five o'clock the temperature had subsided to normal. A similar rise occurred on the second day following, reaching 104.8°. The blood examination revealed numerous malarial organisms of the tertian type. The patient was not given quinine until the third chill, which occurred on the second day following, when the temperature rose to 105.8°; the same quantity was then administered as in the preceding case, with a similar result. The cystitis having cleared up on the twenty-ninth day after the operation, the fistula was closed in the ordinary way and the patient was discharged ten days later in excellent condition.

The acute inflammation of the bladder suggested at first thought an ascending pyelitis as the cause of the chill, but again the temperature chart and the examination of the blood definitely settled the diagnosis.

Case No. 3. A. G., age 33. Patient was operated upon by Dr. Kelly in the hospital in October, 1895, for chronic inflammatory disease of the right tube and ovary and hæmatoma of the left ovary. She returned complaining of chills and fever of about one week's duration, and a discharge from the abdominal incision. Since the operation the menses have been irregular, appearing at intervals of four to eight weeks. No leucorrhœa.

Present condition. Patient says she has been greatly benefited by the operation and has gained about forty pounds. She had not suffered any pain until the past month, when she began to have some of a shooting character in lower right side and back. They were not constant, but at times very severe. At present there is no abdominal tenderness, but there is a slight discharge from the incision. One week ago she was taken with chills and fever, which have recurred daily up to the present time. During this period the abdominal pain has not been more marked than previously. Micturition negative, the bowels constipated.

The patient's temperature on admission was elevated. The physical examination did not reveal the cause of the fever. A small sinus in the lower angle of the abdominal incision leading down to a buried silver wire suture explained the discharge of which the patient complained. By a vaginal examination the uterus was found movable and not enlarged. A sensitive induration extended from the right cornu out to the pelvic wall. On the left side of the uterus there was no evidence of disease.

The day after admission a morning chill occurred, followed by a rapid rise of temperature, which subsided during the afternoon. As the condition suggested malaria, a blood examination was advised, and several tertian organisms were discovered. Quinine was immediately ordered, with complete disappearance of all symptoms in a few days. The silver wire suture was withdrawn, followed by spontaneous closure of the sinus.

The patient's previous history and operation at once gave ground for assigning a local pelvic trouble as the source of the infection. This seemed to be confirmed by the condition found by digital examination, and operative procedure was

almost decided upon when the subsequent chill put us upon the right clue.

Case No. 4. Mrs. M. J. T., age 49, colored. Married. Has had five children and three miscarriages. The youngest child fourteen years old. First labor was a breech presentation, and in all the others the placenta had to be extracted. Miscarriages all occurred before the birth of the last child.

Menstrual history: she has always been regular until six weeks ago, when the flow lasted for two weeks. The usual duration is one week, and the flow very profuse. Last regular menstruation two months before admission. She has had a free leucorrhœal discharge for the last two weeks, which has become offensive.

Family history negative.

Personal history: she had rheumatism in legs during past year, typhoid fever twenty-five years ago. There is a history of chills and fever for a number of years. The present trouble began fifteen years ago, when she first noticed a slight swelling of the abdomen, which has been growing slowly and steadily larger. During the past two weeks she has suffered with severe bearing-down pains in the lower abdomen. She has had considerable palpitation of the heart. The week before admission claims to have had chills and fever every other day.

General condition: appetite poor; she sleeps fairly well; is a well nourished woman, but has not been able to do any work for the past two weeks on account of the pain.

Examination: heart and lungs negative. Skin and mucous membranes pale. Abdomen distended by a mass extending from symphysis pubes to umbilicus, which has a symmetrical outline, has a smooth surface, is non-fluctuating, softish, and decidedly sensitive.

Vaginal examination: the cervix is low in the pelvis, nearly flush with the introitus, the os is dilated to about 4 cm. in diameter; the lips are soft, but do not break down on examination. The canal is occupied by a soft boggy mass which protrudes from the os. The tumor in the abdomen is directly continuous with the cervix.

Diagnosis: submucous myoma.

Operation Sept. 5, 1896. Hysteromyomectomy after Dr. Kelly's method of continuous incision from left to right. No difficulty encountered. A gauze drain was introduced through the dilated cervix into the pelvis. The abdomen closed with buried catgut and silver wire sutures. The patient's temperature from the time of admission to operation ranged from 98.4° to 101.6°. She was allowed to indulge in the luxuries of return from the operation the luxuries.

Sept. 10. The cervical drain was removed, temperature at the time being 102°. An offensive discharge became apparent after the removal of the drain.

Sept. 12. Abdomen exceedingly tender. The tongue is raw and sore.

Sept. 13. Abdomen still exceedingly tender. The tympanites is slightly lessened since removal of the gas. The tongue is decidedly worse, and the vaginal discharge continued profuse and foul.

Sept. 14. Abdominal tenderness has continued and complained about the incision. On examination the incision was

found widely separated throughout its length, with a free discharge of pus. The vaginal discharge continues as before. Temperature 103.4°.

Sept. 15. Patient not improved. The vaginal discharge continues. Tongue decidedly cleaner. The abdominal incision is still discharging freely. Complains for the first time of swelling and pains in thighs and feet, especially of the right leg. On examination the right leg was found swollen and sensitive to touch. At 4.20 temperature suddenly went up to 105°, followed by great exhaustion and signs of collapse. Patient responded to stimulants, and in a few hours was much more comfortable.

Sept. 16. The discharge from the incision still continues free. The right leg very badly swollen and exceedingly sensitive. Vaginal discharge less and tongue much better.

Sept. 17. Tongue practically well, and other symptoms greatly improved.

Sept. 19. Patient improved until 4 P. M., when temperature rose to 104.2° attended with delirium. No induration could be felt about stem of cervix or in pelvis.

Sept. 24. Patient's blood examined and the tertian organism discovered. Patient was put upon quinine, but it made no impression upon the temperature.

Sept. 27. The incision nearly healed, and the vaginal discharge has become less and more healthy in appearance. Temperature still ranges from 100.2° to 103°.

Oct. 15. The temperature since operation has not fallen to normal, the highest point being 105.8°, but this morning at eight o'clock it dropped to 98.6°.

Nov. 4. Patient discharged to-day. Temperature since last note has never reached higher than 100°, and for the past week has been practically normal. The abdomen is perfectly healed. The vaginal discharge is healthy, and the pelvis is free from inflammatory induration.

The coincident malarial and wound infection made this case most puzzling, and if the other cases had not aroused our suspicions, it is doubtful whether the organism would have been searched for. While the administration of quinine did not at once control the temperature, it at least disposed of one cause of it.

THE AGGLUTINATIVE ACTION OF THE BLOOD SERUM OF PATIENTS SUFFERING FROM TYPHOID FEVER.

By E. Bates Block, M. D., *Assistant Resident Physician, The Johns Hopkins Hospital.*

Perhaps the most suggestive result of the study of the artificial production of immunity in animals, since the introduction of the serum-therapy, has been the application of the principles expounded by Pfeiffer to the diagnosis of typhoid fever.

It will be recalled that this author, by the use of the blood serum of animals rendered immune from the cholera vibrio, was able to show that the bacterial protoplasm of the various comma bacilli, more or less nearly resembling the cholera organism, were distinct from each other and were each one entirely specific. He found that the cholera organisms, when mixed with the blood serum of an immunized animal and introduced into the peritoneal cavity of a guinea-pig, quickly lost their motility and very soon underwent disintegration.

This effect, which was so striking and invariable when the micro-organism and the blood serum of an animal immunized from it were employed, failed to be exhibited when, with the same serum, other, though nearly related, micro-organisms were subjected to the same treatment. Thus it became possible, at a time when the specificity of the vibrio of Asiatic cholera was more or less unsettled, to prove by this reaction its entire independence, and to separate it from forms nearly approaching it in morphology and presenting many of its cultural characteristics.

The application of the same principle to the differentiation of the bacillus of typhoid fever from the colon group of micro-organisms was successfully made by Pfeiffer, and later by Lœffler, Dunbar, and others. The credit, however, of modifying the test so as to utilize specific bacteria for the detection of the presence of definite immunizing substances in the body fluids,

should be given to Gruber and Durham, Widal, and Grünbaum. The particular phenomenon which promises to be so useful in assisting in the diagnosis of typhoid fever consists in a clumping, or agglutination, of the typhoid organisms when brought into contact, outside the body, with the body fluids containing the immunizing substances. This reaction, first noted by Bordet, and more fully studied by Gruber, and his pupils Durham and Grünbaum, occurs when the bacteria are mixed with blood serum containing a sufficient quantity of the specific immunizing substance.

The method employed by Widal is to obtain a syringe of blood from a vein of the forearm of a patient suffering from typhoid fever, the serum being allowed to separate from the clot. He then makes a dilution of from ten to twelve parts of bouillon to one part of serum, inoculates this with typhoid bacilli, and places it in the thermostat at 37°, until the next day, when the upper part of the fluid appears clear and a white precipitate is seen at the bottom. The control tube is more cloudy and no precipitate forms.

This test-tube reaction was first noticed by Charrin and Roger in working with the bacillus pyocyaneus in animals immunized against that organism.

The method advised by Grünbaum, in the *Lancet* of the 19th of September, 1896, seems to be the most satisfactory, and with slight modifications is the one which we have adopted here. His method is as follows: A drop of blood is taken in a U-shaped capillary tube from the ear or finger and centrifugalized; the tube is then broken off at the junction of the serum and the corpuscles, and the former blown out upon a glass slide or into a watch-glass. The necessary quantity is then

sucked up to the first mark on a straight capillary tube which has another mark corresponding to sixteen times the volume indicated by the first mark. Bouillon is then sucked up with the serum until the second mark is reached. The fluid is then blown out into a watch-glass, thoroughly mixed, and again sucked up, the process being repeated several times to insure thorough mixing of the bouillon and serum. The emulsion of typhoid bacilli is prepared by taking a platinum loopful of a culture not more than twenty-four hours old, grown on rather dry agar, and carefully rubbing it up with a drop of the bouillon against the side of a test-tube containing one ccm. of bouillon, and subsequently mixing it with the whole amount. A drop of the serum-mixture and a drop of the typhoid emulsion are then thoroughly mixed on a cover-slip and examined as a hanging drop. A control cover-slip should be made from the typhoid emulsion alone in order to be sure that there are no, or very few, pre-existing clumps. If the serum-emulsion-mixture be looked at immediately after mixing, the bacteria will be seen free in the field and actively motile. Gradually, however, if the case be one of typhoid fever, they will be seen to stick together, and the clumps become larger and larger by the addition of other bacilli, until, in half an hour, if the reaction be marked, all, or nearly all, of the bacteria are in clumps or agglutinated, and have completely lost their motility. The only modification which we have made is to take the blood from a vein of the forearm; this affords a larger quantity of serum and permits of several different tests being made from the same serum. This seems by far the most satisfactory method for several reasons: (1) Normal serum, if not diluted sufficiently, causes a slight clumping of the bacilli, and in some cases it is quite as marked as in very early cases of typhoid fever, although in the absence of typhoid fever the motility is not destroyed. (2) The clumping is only relative, and without time limitations as well as a definite degree of dilution the results cannot be considered constant. (3) This method is much cleaner than the dried blood method (*vide infra*), and the amount of dilution can be more accurately controlled. (4) The reaction may be more quickly determined than by the test-tube method. According to Grünbaum the reaction may be present on one day and not on another, so that several examinations should be made. By this method he obtained a marked reaction in eight cases of enteric fever, and a negative result in thirty-two other cases, with the exception of a case of jaundice, in which there was a marked reaction. So that the negative result does not exclude the presence of typhoid fever; while a positive result, if marked, is in favor of the diagnosis of typhoid fever.

In twenty cases of typhoid fever tested in Professor Osler's wards, in conjunction with Dr. C. N. B. Camac, with a dilution of 16 : 1, and the time limited to one-half hour, the reaction was complete or marked in eleven cases. The earliest reaction observed was on the 10th day; the latest on the 106th day: in the others the test was made between the 41st and the 69th day, except in one case in which it occurred on the 90th day. All of these cases had had very severe attacks, and two of them had relapses.

In six cases the reaction was partial. They ranged between the 16th and 67th days, only two of them being later than the

38th day. In all of these cases the illness was of moderate severity, although one case had a relapse.

In three cases the reaction was slight; these were all mild cases, and were tested on the 8th, 24th and 60th days of illness. One of these cases had a relapse. The only diseases other than typhoid fever in which we have obtained clumping of typhoid bacilli are diabetes and malaria. In one case of diabetic coma a partial reaction was obtained, and in one case of pernicious comatose malaria it was very marked, although the motility of the organisms was not completely destroyed in either of these cases, nor did either of them give a history, or show evidence of the existence, of typhoid fever.

At present we are unable to say definitely to what property of the serum agglutination is due, although many theories have been brought forward to explain it.

Besides in the serum, agglutination has been observed in milk, urine, pus, blister-fluid and tears. We believe that we have obtained it from the stools in two cases.

It is not given by œdematous fluid, aqueous humor, saliva, gastric juice, and bile free from blood.

Among the diseases in which it has been demonstrated are cholera, pyocyanean infections, typhoid fever, tetanus, pneumococcus infections, diphtheria, and so forth, but each with its own specific serum.

In one case of typhoid fever the blood taken at autopsy yielded only a partial reaction.

In a case with perforation, successful operation and subsequent relapse, the reaction on the 106th day was very marked within 5 minutes, though the patient at the time was convalescent.

According to Widal and Sicard, the clumping is less marked as the activity of the fever lessens, disappearing altogether about the 41st day. In the few cases that we have tested here this did not seem to be the case.

In most of the foregoing tests cultures of typhoid bacilli from three different sources were used. The cases that reacted at all, reacted most markedly with one of them alone: with the other two cultures agglutination was much less marked. This is fully in accordance with the fact that the more virulent the culture the more marked is the reaction, although the virulence of this particular culture had not been established. Also, as was pointed out by Pfeiffer, if the animal be rendered immune by a very virulent culture, the agglutinative action is remarkably increased.

There remains one more method which, if it can be made more accurate, will be easy, and of practical value as an aid to diagnosis. Widal first noted that dried serum, even dried blood, if moistened with sterile water or with serum, would produce the reaction. Wyatt Johnston of Montreal has tried this method very thoroughly, and the following is taken from his article. A drop of blood is obtained from the ear or finger on a sterile glass slide or piece of paper, allowed to dry, and is then moistened with a drop of sterile water. The water is mixed with the serum of the drug is blood; an emulsion of the is then one of typhoid emulsion and examined as a hanging drop. By this method is used just for bacterial the reaction as late as three weeks after taking the blood.

He seems to have had successful in every case tested.

The results which have been obtained here by this method are so far uncertain, and do not show the regularity of action so prominent in the former method.

In the 17 cases of typhoid fever tested in Professor Osler's wards, the reaction with dried blood was marked in 9 cases; of these, 6 were severe attacks and 3 had been mild.

In three cases the reaction was partial; two of these were severe, and one was of moderate severity.

In two mild cases, one on the 3d, the other on the 17th day of illness, the reaction was doubtful.

In three cases the reaction was slight; of these, one was a mild case and one severe. The third case at the beginning of relapse showed no agglutination, but nine days later it was slight. The relapse was of moderate severity.

I wish to express my thanks to Professor Osler for the opportunity of studying the cases included in the report.

PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS HOSPITAL MEDICAL SOCIETY.

Meeting of October 19, 1896.

Dr. THAYER in the chair.

Case of Addison's Disease—Death during Treatment with the Suprarenal Extract.—DR. OSLER.

Maggie S., aged 21, applied at the Medical Dispensary of the Johns Hopkins Hospital, May 15, 1896, complaining of weakness and discoloration of the skin. A day or two subsequently she was seen by Dr. Thayer, who suspected Addison's disease and asked me to see her. The condition seemed very suggestive, and I admitted her to Ward G on June 19th. The following is the account as obtained by Dr. Block:

The family history was good, though one grandfather died of consumption of the throat, and one uncle had consumption. She has four sisters and two brothers, all well.

As a child she had eczema very badly, which again appeared after an interval of twelve years, affecting only the ears. She had diphtheria and scarlet fever, and three years ago influenza. She has had what she calls slight rheumatic trouble in the left knee for four or five years. For the past four winters she has had cough, with a small amount of sputum, never any night sweats. The cough always ceased in the spring. She has often had cramps in the stomach, particularly when she caught cold. Her menstrual function has been regular. In the dispensary history it is stated that a year ago last winter some of the glands were swollen, and the mother said she had scrofula.

Her present illness she thinks dates from about a year ago, when she began to have headaches in the frontal region, which have troubled her on and off until about eight weeks ago. At this time she had a chill, the only one she has ever had, and following it she was so prostrated and weak that she was in bed for nearly three weeks. At this time she often had the cramps in the lower abdomen. Two months after the headaches began, that is in August, 1895, she first noticed a change in the color of the skin, appearing about the face, and particularly the nose, which became very yellow and then dark brown. The upper lip was next affected in the same way, and gradually the whole face, which assumed a yellow color with dark brown blotches. The process came on very gradually and soon affected the surface of the body and the skin of the external genitalia. Accompanying this pigmentation and the headaches she had weakness, which gradually became more and more marked. She tired easily on walking,

often got suddenly dizzy, everything became black before her, and she would have to catch hold of the nearest object to prevent falling. She states that these sudden weak feelings would come on also when she was sitting still. She had lost in weight in two years ago from 115 to 96 pounds. A symptom, too, of which she complained a good deal was itching of the skin.

She was a bright, intelligent looking girl, not much emaciated. She had no fever, and for the eleven days she was in hospital the temperature did not rise above 99.5°, and the early morning temperature was often 97°. There was no anæmia. The blood count on admission was 4,500,000 red per cubic millimetre, and on the 25th it was above 5,000,000. There was no leucocytosis, and the differential count gave polynuclear leucocytes, 33 per cent.; small mononuclear, 45 per cent.; large mononuclear, 12 per cent.; transitional, 2 per cent.; eosinophiles, 4 per cent.

The condition of her skin was as follows: The scalp had a shining yellow color; the hair was dry and very coarse. The face had a yellow, dull, dark color, with blackish brown splotches, situated just above both eyebrows, across middle half of nose, and involving the whole of upper lip. The eyelids and the inner canthi of the eyes were also very dark. The face showed from fifteen to twenty very small, almost black pigmented areas, some of which resembled moles. The neck had similar small areas.

The abdomen, chest, back, legs and arms had a similar dark yellow brown color. The areolæ of the nipples were large and deeply pigmented. Below and to the left of the umbilicus there was a bean-sized brown-black area. Both flanks were almost black in color. Nearly opposite the first lumbar vertebra on the back was a bean-sized mole, deeply pigmented. The gluteal grooves were almost black. The skin of the legs was brownish, and around the knees deeply pigmented. The lower parts of the legs were not so dark colored. The backs of both hands were deeply colored, especially the joints and about the roots of the nails. The hands and feet were cold and moist. On the inner side of left wrist were two deeply pigmented scars. Over the whole body were pin-head sized whitish areas which gave somewhat the appearance of cutis anserina, but not raised. No large leucodermic patches were present. There were a few patches of pigmentation on the buccal mucous membrane.

The lungs were negative; she had no cough and no expectoration. The heart sounds were rather weak and not well heard. There was a venous hum in the right side of the

neck. The pulse ranged from 76 to 96 and was regular. There was no enlargement of the liver or of the spleen, and there was no dilatation of the stomach. The examination of the lower abdomen was negative. There was no enlargement of the external glands. The urine was acid, amber colored, specific gravity 1015.

On June 22nd the adrenal glycerin extract was begun. It was made in the following manner. Fifty-four perfectly fresh pig's adrenals were finely chopped up and thoroughly mashed with pestle and mortar. They weighed 114 grammes. To this 114 cc. of pure glycerine was added, and 114 cc. of aqua chloroformi. This was allowed to macerate after thorough mixing for twenty-four hours. It was then strained several times through towels and twice through filter paper, the latter in a refrigerator. The last filtrate was a rather cloudy, reddish, thick fluid with a meat-like odor. About 200 cc. remained after filtering, so that 3.7 cc. represented one gland. The patient was started on ℈ss t. i. d. = 2 cc., or one-half a gland.

On the day following the administration she complained of cramps in the lower part of the abdomen and slight headache, symptoms which she said she had frequently had on previous occasions.

On the 25th she had hiccough very badly for fifteen minutes. This, too, she states that she has had at intervals for the past year. There had been no increase in the pulse, no change in the temperature. Her appetite and digestion were good, and the blood count had risen above normal.

On the 29th she was not so well. She vomited for the first time. The extract was then stopped. She began to have diarrhoea, and felt very giddy and faint.

On the 30th the vomiting persisted, and she had attacks of weakness in which she became short of breath. The cramps in the abdomen had ceased, however, and she felt better. There was no increased rapidity of the heart's action.

July 1st. At 2.45 this morning she became very noisy, screaming and calling out, and the pulse was very weak. The temperature was 97.5°. She became quiet again, but did not seem quite rational. At eight o'clock she lay with her eyes half closed, breathing rapidly and noisily. The pulse at the wrist could not be felt. She would not protrude her tongue, and when aroused she became very restless and tossed herself about, throwing off the clothes. The pupils were of medium size and reacted to light. The heart impulse could not be felt; the sounds were very feeble, and the pulse was 128 to the minute. At times the respirations became extremely feeble, almost sighing. A few minutes after this note was made the patient died suddenly.

The autopsy by Dr. Flexner showed the following condition: Both suprarenal glands were the seat of extensive caseous disease, chiefly in the form of nodules which were partially calcified. There was no trace of normal gland tissue remaining. The caseous process extended beyond the limits of the gland into the adjacent lymph glands, which, though little enlarged, were also involved. The abdominal lymph glands and those of the anterior mediastinum were somewhat swollen. There was no involvement of the solar plexus or of the splanchnic nerves. Peyer's patches in the ileum were a little swollen, and the solitary follicles in the large intestine

were somewhat enlarged. The left lung showed a thin, wedge-shaped, triangular area near the base, with caseous nodules, some as large as a pea. At the right apex there was some thickening and retraction of the pleura covering an old caseous, partially calcified nodule, and the pleura on this side was obliterated. There were no other tuberculous foci in the body. The heart looked normal.

Remarks.—Of course the first question which suggests itself is whether the toxic symptoms, of which this patient died, were due to the suprarenal extract. Addison's disease may prove fatal either by a gradual asthenia, the result of the vomiting and diarrhoea; by sudden syncope, which may occur at any stage of the disease; by extension, local or general, of the tuberculous process, and lastly by a sort of toxæmia, in which the patient for several days may have nervous symptoms, such as this patient presented. In a paper published in the International Medical Magazine for February of this year, in which I have reported six cases of the disease, Case IV, a patient of Dr. Mullin's, at Hamilton, for forty-eight hours before death had the following group of symptoms: a slight convulsion, which was followed by a dazed condition in which he did not seem to appreciate what was said, great feebleness and rapidity of the pulse, sighing respirations, cold hands and feet, and subsequently much restlessness, pulling at the bed-clothes, and tossing about from side to side. The symptoms were very much the same as those presented by this patient, and I do not think that we can hold the extract responsible. The doses were not excessive. I had hoped to show you the case of Addison's disease which we had under treatment last year and which was shown to this society on several occasions. He has not been regularly under treatment, but Dr. Futcher reports that he is still alive, though weak and failing.

Treatment of Ectopic Pregnancy by Vaginal Puncture. Dr. Kelly.

I have an interesting and important subject to bring before you to-night, a novel method of treatment of extra-uterine pregnancy, briefly discussed before this Society at the meeting, October 23, 1893 (see Bulletin, Nov., 1893, p. 109).

Previous to October 23, 1882, it had been my habit, whenever extra-uterine pregnancy was recognized, whether ruptured or unruptured, to extirpate the sac and the clots, through an abdominal incision, at the earliest possible moment, but I had a patient who was too weak for this plan of treatment, and I determined to try a vaginal puncture. I therefore punctured the vaginal vault with scissors, cleaned out the clots, and drained, and the patient got well. In another case, after I had opened the abdomen I found the intestinal adhesions so intimate with the sac and so fully walled off that I determined to make a vaginal puncture. With my finger introduced within the abdominal incision to guard against any encroachment upon the abdominal cavity I made a free opening into the vaginal vault, through which the wound was drained, and the patient recovered. I have now the records of several cases limited in this way, all of which have done well; these I am hereto-night to read and to offer suggestions in the process of recovery. Certainly in these cases

rapid and smooth, and it is especially satisfactory, in that the patient has simply been relieved of the abnormal products without losing any of her normal pelvic structures.

The Operation. I do not consider it necessary any more to make the abdominal incision. After an accurate diagnosis of the case, outlining the sac and its relations by abdominal and rectal palpation, and after careful vaginal palpation, to determine the proximity of the sac to the upper vaginal wall, a point is located behind the cervix in the vaginal fornix close to the sac, and a pair of sharp scissors is plunged upward in the direction of the axis of the pelvis. The scissors are then opened and some of the fluid blood usually trickles out at once. Larger scissors are then introduced, if need be, and the opening widened by withdrawing them with blades open. It is important to have a large opening, both for the purpose of getting two fingers in to clean out the sac and for good drainage afterward. The torn edges of the wound never bleed excessively. The sac must be delicately cleaned out, and everything be brought away down to the shell of the sac and surrounding adhesions. In one of these cases I brought out a well-defined Fallopian tube cast, due to hemorrhage in the tube. The cleaning out is followed by irrigation, after which the sac is plugged with gauze, which is left in for several days, and sometimes longer, and then the wound is washed out daily until it closes. I know of no instances of more than moderate suppuration following this plan of treatment.

The *a priori* objections to this procedure are several. In the first place, the question arises, would you treat an unruptured tubal pregnancy in this way ? I have never seen but two early unruptured tubal pregnancies, and it is improbable that an unruptured tubal pregnancy at an early stage would be diagnosed at all. It is then practically a question which we do not have to answer. As to the possibility of hemorrhage, the tube having ruptured, the villi become degenerated, and sudden hemorrhage from these surfaces is the great danger to which these patients are liable. But practical experience from these ten cases shows that the occurrence of hemorrhage is not an imminent danger. In nine cases there was no hemorrhage of any moment after cleaning out the sac. In one case, however, a very important exception, there was an active hemorrhage which I was unable to stop, so I opened the abdomen, extirpated the sac and so checked the hemorrhage, and the patient recovered. For this reason any one who undertakes the vaginal puncture must be prepared to make an abdominal section.

One would think that such cases would be particularly prone to suppurate. You expose an area which contains debris not under the control of the tissues of the body, and so peculiarly liable to become septic, if any favorable opportunity is offered ; but under the plan of treatment I have detailed, active suppuration has not occurred.

There is one other danger, and one of these cases vividly illustrates it. In some cases the walls of the sac are quite thin, and may readily rupture up towards the abdominal cavity. This did not occur in any of my cases, but something akin to it did. The douche nozzle in one of the earliest cases was thrust through the sac into the abdominal cavity several days after the operation, and a couple of quarts of boric acid solu-

tion was forced into the peritoneal cavity. I had to open the abdomen one night above the symphysis, to wash out the boric acid solution. The patient made an excellent recovery in spite of the fact that over a litre of the solution was in the abdomen for some time.

The plan I have outlined not only marks an important deviation in the treatment of extra-uterine pregnancy, but it also will serve as an index of the line of progress that is being made in general in the domain of gynecology. I uniformly treat all pelvic suppuration cases in the same way where I have good reason to think that I can get at the pus and establish good drainage. The present method of treating these cases is to take out the uterus by the vagina. I have insisted all along that I can get just as good drainage without taking out the uterus. The subject has therefore a broader bearing than the aspect in which I have presented it before the society to-night.

Dr. L. F. Barker.—One objection that might have been raised a year or two ago to the operation Dr. Kelly advises, has recently apparently been made less weighty, that is, the danger of sepsis from bacteria in the vagina. It has been shown by Menge, of Professor Zweifel's clinic in Leipzig, for non-pregnant, and by Krönig of the same institution for pregnant women, that the vagina is nearly always aseptic, that is, free from bacteria that can do harm to the tissues. Döderlein had asserted that the vaginal secretions of women could be divided into two classes, those in which pathogenic bacteria were present and those in which they were absent. It has been shown by Menge and Krönig that within a few hours after the introduction of any body from the outside, even though it be not aseptic, the vagina becomes practically free from pathogenic bacteria. Even if bacteria be introduced experimentally in pure cultures, the vagina is capable of freeing itself in a few hours of streptococci, staphylococci and other pyogenic forms. Menge and Krönig found that the normal inhabitants of the vagina, both cocci and bacilli, are for the most part anaërobic and non-pathogenic. Krönig in his experiments first introduced artificially into the vagina the bacillus pyocyaneus in order to see the effect of the vaginal secretions upon it. Having found that in a few hours all the bacilli were destroyed, he afterward introduced virulent streptococci and staphylococci, and they were just as rapidly and surely destroyed. The vaginal secretion therefore appears to possess active bactericidal powers.

These investigators have further pointed out that irrigation of the vagina before the introduction of the bacteria materially lessens the bactericidal powers of the secretions. Thus for example, irrigations with lysol or sublimate, or the thorough scrubbing of the vagina, previous to the introduction of the outside bacteria, enabled the bacteria to survive for a long time in the vagina, whereas if the irrigation and scrubbing were omitted the bacteria introduced were rapidly killed. They concluded that in cases of operation in the vagina or through the vagina, irrigation should not be employed, and that the most important point to be observed is to omit any examination with fingers that are not aseptic, or the introduction of anything which could carry with it pathogenic bacteria into the vagina, including the prohibition naturally of coitus for some hours preceding the operation. It is better,

they think, to trust to the natural bactericidal powers of the vaginal secretions under all circumstances, even under pathological conditions, than to attempt to sterilize the vagina by ordinary irrigating methods. I think the results of these investigations are very important in connection with the operation which Dr. Kelly has spoken of to-night, and may in part account for the successful results and the absence of suppuration in his cases. (Cf. review of articles by Krönig and Menge, J. H. H. Bulletin, Vol. VII, Nos. 59–60.)

Dr. KELLY.—A very good contrast, and one which answers Dr. Halsted's question, is that between this class of cases and the suppurating sacs that we open; in the latter, although carefully cleansed, there is a continuous weeping of pus during the healing process. The two classes of cases are different in their clinical characteristics.

I am very glad that Dr. Barker has called attention to these important results from Professor Zweifel's clinic; they are not sufficiently well known in this country. It is interesting to note that Menge's work has superseded that of Döderlein.

NOTES ON NEW BOOKS.

Manual of Midwifery for the Use of Students and Practitioners. By W. E. FOTHERGILL, M. A., B. Sc., M. B., C. M., etc. With double colored plate and 69 illustrations in the text. 12mo, pp. 484. (*New York and London: The Macmillan Company*, 1896.)

This is an admirable little book, clearly and concisely written and systematically arranged. The illustrations, when not diagrammatic, have generally been made from frozen sections, and are a genuine assistance to the student. The account given of menstruation, ovulation and conception is fresh and in accord with modern views. Ectopic gestation is also fully and satisfactorily considered, and the chapter in which it is described is a model of clear and accurate statement. The chapters on labor, the use of the forceps, the induction of premature labor, symphysiotomy, etc., are also to be commended. As might reasonably be anticipated, there is a degree of local coloring in the book which is pardonable when the position of Edinburgh in medical teaching is considered.

Twentieth Century Practice of Medicine. Volume V. Diseases of the Skin. Edited by THOMAS L. STEDMAN, M. D. (*New York: Wm. Wood & Co.*, 1896.)

The contributors to this volume on dermatology consist of some of the most competent experts both in this country and in Europe, and the results are, speaking generally, excellent. Of course, as one would expect, some articles are particularly good, especially from a practical standpoint; others again make excellent monographs, but their lengthy and almost useless discussions are to be deplored. A weak point of this volume, as well as of many other modern standard works on cutaneous diseases, is the meagre and often untrustworthy descriptions of the pathology of the affections described. We have already a large number of excellent works on dermatology, and although some considerable advance has recently been made in dermato-pathology, we see little of it in the newer works. Again, the pathology of dermatology is almost entirely ignored by pathologists, and yet in cutaneous diseases we have the best field for experimental research.

The first article, by C. W. Allen, on the "Anatomy of the Skin and its Appendages," is short and contains a good résumé of our present knowledge of the physiology and anatomy of the skin.

On page 7 Allen says that " It is at the level of the granular cells that fluid exudations into the epidermis effect a separation of the layers when bullæ form or vesiculation occurs." This is not correct according to the more recent work on this subject, for vesicles may begin to form (1) between the horny and the granular layers, (2) in the centre of the rete Malpighii, (3) in the deeper layers of the epidermis, and (4) beneath the epidermis.

We do not find any description of the various sense points of the skin, which we think ought now to be given in a modern textbook.

"Parasitic Diseases," by L. D. Bulkley, is excellent and is the most practical article in the whole book. He has made a new departure in that he has added a third class, viz., "Diseases caused by micro-organisms of uncertain nature," the other two classes being "Diseases caused by (1) animal and (2) vegetable parasites." Under vegetable parasites also he has included myringomycosis, vaginomycosis and labiomycosis. Another ought to have been added, although only two cases have thus far been recorded, viz., diseases due to the invasion of blastomycetes or organisms allied to the yeast fungi. Bulkley makes the statement that tinea versicolor is very uncommon in this country and forms only one per cent in the statistics of the American Dermatological Association, whereas in Baltimore we consider it quite a common disease. His statement is probably due to the fact that patients with this cutaneous affection do not apply to the dermatologist for treatment because subjective symptoms are practically absent.

"Erythematous Affections," by H. H. Whitehouse, is fairly good, but the pathology is not at all clear, and in some instances cannot be accepted. His descriptions of bullous and pustular affections are much better.

The article by J. N. Hyde, on "Eczema and Dermatitis," is thorough, well written and very practical. It will prove to be of great value to students and practitioners. Under dermatitis calorica he says that in the vesicular stage, " when examined in section, it is clear that the blebs are histologically identical with those seen in herpes zoster, pemphigus and other affections characterized by the formation of bullæ." This most sweeping statement certainly cannot be accepted. The character of the vesicle of herpes zoster is quite distinct from all the other affections mentioned, and it may be added that almost all the vesicular and bullous affections exhibit some, if only slight differences both as to location and contents.

As we might expect, Crocker's articles on "Squamous Affections" and "Phlegmonous and Ulcerative Affections" are all that may be desired.

The " Papular Affections," by L. Brocq, is an article which, as a monograph, cannot be too highly praised, but for a text-book is too long and almost wearisome.

A. V. Harlingen has written two sections, one on "Diseases of the Sebaceous Glands," and the other on "Diseases of the Sweat Glands." They are both good, complete, and deserve much credit.

"Diseases of the Hair and Nails" is a well written section by D. W. Montgomery, and is a good résumé of the subject.

The article on "Benign Neoplasms," by John T. Bowen, is very good, especially the pathology.

Xeroderma Pigmentosum, or Kaposi's disease, written by its author, is such an extremely rare affection in this country that it hardly warrants the detailed description which is here given.

The last and longest article in the volume is written by H. Leloir. These excellent descriptions, like Brocq's, are too lengthy and discursive for a text book and could be considerably cut down with benefit. He emphasizes the fact that dermatologists should "admit the existence of intimate relations between diseases of the skin and those of the nervous system, for they demonstrate that the nervous system is really a fundamental something, and that the skin may be considered schematically as a peripheral and terminal expansion of the nervous system."

The whole volume is well bound, fair type is used throughout, but the illustrations are to be severely criticised, not on account of their quality, but on account of their paucity and distribution.

There are sixty-six illustrations in all, of which fifty accompany the first two articles, viz., on Anatomy of the Skin, etc., and on Parasites, whereas the remaining sixteen illustrate rare diseases, *e. g.* xeroderma pigmentosum is accompanied by eleven drawings. It would have been far preferable to have illustrated the descriptions of the commoner diseases, as has already been done in two or three of the later text-books on dermatology.

Judging the volume as a whole, we feel safe in recommending this new text-book to students who wish to enter this special branch of medicine at all thoroughly, and to practitioners for the excellent practical advice which will be found contained in it.

T. C. G.

A Pictorial Atlas of Skin Diseases and Syphilitic Affections, in photo-lithochromes from models in the Museum of the Saint-Louis Hospital, Paris, with explanatory woodcuts and texts by Ernest Besnier, A. Fournier, Tenneson, Hallopeau, Du Castel, Henri Feulard, Léon Jacquet, of the Saint-Louis Hospital. Edited and annotated by J. J. Pringle, London. (*F. G. Rebman, Publisher, London, and W. B. Saunders, Philadelphia.*) Part I. Price $3.

This number constitutes the first publication of a series of twelve parts. To those who have had the advantage of seeing and studying the wonderful Baretta models in the Saint Louis Hospital at Paris, the photo-lithochromes of this pictorial atlas will remind them very vividly of those reproductions. Accompanying the colored plates are descriptions by the distinguished experts of the Saint-Louis Hospital, so that a new illustrated text-book on cutaneous affections will thus be published. Part I contains four plates which, together with the text, constitutes twenty-eight quarto volumes, paper bound. Plate I represents a pronounced case of Lupus vulgaris on the central portion of the face. Although this may be a faithful reproduction of Baretta's model, it does not represent lupus vulgaris as we are in the habit of seeing it, which is accounted for by the fact that the disease has existed for some length of time. The smaller nodules do not exhibit that "apple-jelly" color which we see in the early lupus nodules. The description is by E. Besnier, and a good, clear, practical account of this disease is the result. Plate II represents the posterior surface of the forearm and hand of a case of dermatitis herpetiformis (Duhring), and cannot be too highly praised; the bullæ, filled with pus, appear to stand out from the plate. This effect of three dimensions is enhanced by placing the illustration against the window-pane and viewing it by transparent light. This

plate ranks as the best photo-lithochrome which we have ever seen. Plate III shows a syphilitic chancre of the vulva, and is also an excellent reproduction. Plate IV represents the thigh, anterior surface, of a case of purpura hæmorrhagica. The case must have been a very severe one, and the effect again is enhanced by transparent light. Woodcuts are added in the text to explain the separate lesions.

The editors and publishers cannot be too highly praised for the beautiful and excellent manner in which these illustrations have been executed.

T. C. G.

BOOKS RECEIVED.

King's College Hospital Reports, being the Annual Report of King's College Hospital and the Medical Department of King's College. Edited by N. Tirard, M. D., F. R. C. P., *et al.* Vol. II. Oct. 1, 1894–Sept. 30, 1895. 8vo. 1896. 376 pages. Adlard & Son, London.

Saint Bartholomew's Hospital Reports. Edited by S. West, M. D., and W. J. Walsham, F. R. C. S. Vol. XXXI. 1895. 8vo. 325 + 155 pages. Smith, Elder & Co., London.

St. Thomas's Hospital Reports. New Series, Vol. XXIII. Edited by Dr. T. D. Acland and Mr. B. Pitts. 1896. 8vo. 522 + 112 pages. J. & A. Churchill, London.

Twentieth Century Practice. An international encyclopedia of modern medical science by leading authorities of Europe and America. Edited by T. L. Stedman, M. D. Vol. VIII. Diseases of the digestive organs. 8vo. 667 pages. 1896. W. Wood & Co., New York.

United States Department of the Interior. Census Office. Report on Insurance Business in the United States at the Eleventh Census, 1890. Part II, Life Insurance. 4to. 1895. 478 pages. Government Printing Office, Washington, D. C.

Manual of Midwifery. By W. E. Fothergill, M. A., B. Sc., M. B., C. M. 12mo. 1896. 484 pages. The Macmillan Co., New York.

A Manual of Obstetrics. By W. A. N. Dorland, A. M., M. D. 8vo. 1896. 760 pages. W. B. Saunders, Phila.

Practical Points in Nursing for Nurses in Private Practice; with an Appendix containing Rules for Feeding the Sick, etc. By Emily A. M. Stoney. 8vo. 1896. 456 pages. W. B. Saunders, Phila.

Water and Water Supplies. By John C. Thresh. 1896. 12mo, 438 pages. The Rebman Publishing Co., London.

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ILLUSTRATIONS.