Date Due

1 Jun '63			

VOL. 65 JANUARY-JUNE 1927

The Journal
OF
Nervous and Mental Disease
AN AMERICAN JOURNAL OF NEUROPSYCHIATRY

FOUNDED IN 1874

NEW YORK
64 WEST 56TH STREET
1927


BOYD
PRINTING
CO

ORIGINAL CONTRIBUTIONS

Vol. 65 JANUARY, 1927 No. 1

The Journal

OF

Nervous and Mental Disease

An American Journal of Neuropsychiatry, Founded in 1874

Original Articles

THE COLUMNAR ARRANGEMENT OF THE PRIMARY AFFERENT CENTERS IN THE BRAIN-STEM OF MAN *

By Walter Freeman, M.D.

Senior Medical Officer, St. Elizabeths Hospital, Washington, D. C.

Introduction

The comparison between the architecture of the spinal cord and that of the medulla oblongata has disclosed many interesting points of similarity and difference. The fundamental basis is evidently the same, yet when we pass from the segmental system proper, as it is expressed in the spinal cord, to the segmental system in the brain-stem, we find it complicated by the exaggeration of some of the components and the practical suppression of others, as well as by the appearance of new and suprasegmental structures. The analysis of the condition must therefore be thorough in order completely to discern the homologies.

It is with a view to the analysis of the end-stations of the primary afferent fibers in the brain-stem that this investigation was undertaken. The writer realizes that there are many gaps in our knowledge of the true conditions and that more work must be done before these gaps are closed, yet he believes that physiological experiments upon sensation have now challenged anatomists to make further efforts to determine the location of the various reception nuclei for the afferent fibers. Moreover, with a recently adapted technic (see Appendix B), the author has been able to discern these primary afferent fibers clearly outlined at a time when most of the other fibers, those that appear later in embryologic development have not yet reached their full development.

* From the Reale Clinica delle Malattie Nervosi e Mentali. Rome, Italy, Director Prof. E. Mingazzini, and from St. Elizabeths Hospital, Washington, D. C., Superintendent Prof. Wm. A. White.

The author's inspiration is due in no small measure to the works of Kappers (1) and of Johnston (8) who through their studies upon the comparative anatomy of this portion of the central nervous system have done so much to establish our conceptions upon the basis of simple primary mechanisms from which the higher ones are later developed, and who have shown so clearly by their methods of analysis which structures are to be looked upon as subserving which function. It has been from the point of view of function that their books have been written. As Johnston well says (p. 95): "It must be insisted that a knowledge of mere structure is of little value and may be misleading without a knowledge of function."

On the other hand a study of structure in different vertebrates allows us to form important conclusions in regard to the functions of these structures. For instance the tractus solitarius, which for so long has been considered to carry gustatory fibers, is apparently anything but a primary gustatory tract, for it scarcely appears in fishes in which organs of taste are developed to an extraordinary degree, and is in full development in the cassowary which possesses probably less than one hundred taste buds. Much more probably, as Kappers has shown, the tractus solitarius is composed of fibers conveying common visceral sensation from the upper respiratory passages, and thus serves as the afferent path for impulses that are concerned with air breathing.

For many years now it has been recognized that the brain-stem is the cephalic continuation of the segmented nervous system, and that, disregarding the nerves of special sense, the afferent and efferent neurones differ only in their degree of importance and in their combinations, from the homologous neurones of the spinal cord. The mesencephalic segment for instance gives rise to the third and fourth nerves, the cerebellar segment to the fifth, the anterior hind-brain segment to the sixth, seventh and eighth, and so on. Further than this, however. comparative anatomists have disclosed in the brain-stem of the lower animals very definite longitudinal columns in which the cell groups are to be found which preside over the functions of each segment. For instance the column lying closest to the midline is the somatic motor, supplying motor impulses to muscles derived from primitive myomeres, and the one adjacent laterally is the visceral motor. Externally again comes the visceral sensory, or as Winkler calls it, the interoceptive, and at the extreme lateral portion the somatic sensory. The somatic sensory may be divided into exteroceptive and proprioceptive parts. This general arrangement as it is found in the simple brain of the dogfish, is shown in Fig. 1, which

I have adapted from Kappers (1, p. 268). I have shaded the proprioceptive portion of the somatic sensory column less heavily. This simple brain shows clearly the arrangement of the various columns.

Before proceeding to the detailed description of the columnar arrangement of the primary afferent centers in the brain-stem of man I believe that it is well to review the functions exercised by the various nerves, laying special emphasis upon their similarities rather

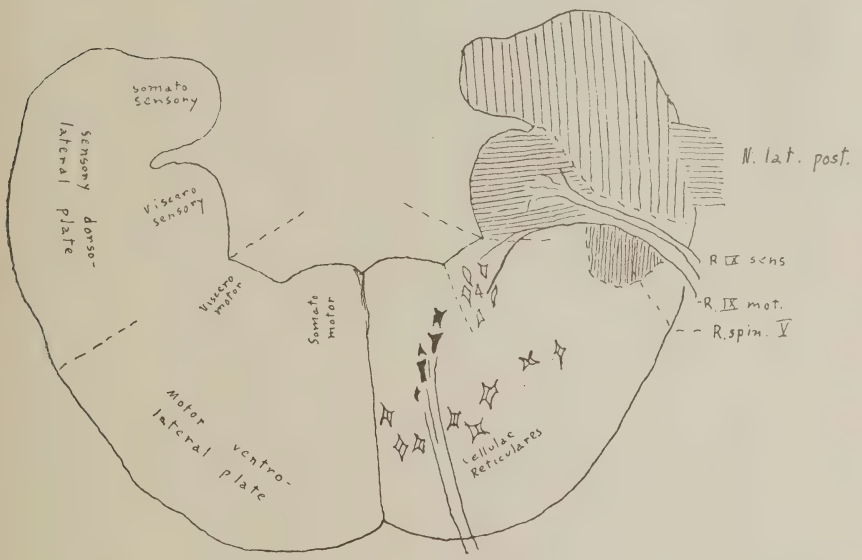


FIGURE 1. Schematic section of the medulla oblongata of the dogfish Scyllium canicula, showing the typical arrangement of the columns. Each side of the brain-stem can be divided into two parts, the ventrolateral motor plate and the dorsolateral sensory plate. These parts can again be divided into somatic motor and visceral motor columns, and somatic sensory and visceral sensory columns. The somatic sensory column is shaded with vertical lines and is made up of two parts, one subserving exteroceptive sensation, represented by the radix spinalis trigemini which is more heavily shaded; the other subserving proprioceptive sensation, represented by the N. lineae lateralis posterioris and its reception nucleus. The visceral sensory or interoceptive column is shaded with horizontal lines. (After Kappers: Vergleichende Anatomie des Nervensystems, p. 268.)

than their differences. To resemble a typical spinal nerve each cranial nerve should consist of a somatic motor, a somatic sensory, a visceral motor and a visceral sensory portion. Each should supply some cutaneous area with all forms of sensation, a portion of the alimentary canal with visceral sensation, certain muscles, bones, joints, etc., with deep sensation. I shall begin with a consideration of the dermatomeres of the head.

I. The Innervation of the Head

In spite of considerable work done in the past upon the cutaneous innervation of the head, this remains the most uncertain of all fields of the body. The uncertainty is due in part to the fact that it has been found only relatively recently by clinicians that the facial nerve carries cutaneous fibers. Cushing (17) in his important work upon the trigeminal nerve (1903), was the first to discuss from the clinical point of view the cutaneous field of the ninth and tenth nerves, although anatomists a long time before had shown the existence of cutaneous fibers in these nerves. Even Cushing did not speak of the facial nerve which was still at that time believed to contain no cutaneous fibers. Later, Ramsay Hunt called attention to this nerve, basing his conclusions upon the fact that herpes zoster of the auricle and external auditory canal is often accompanied by facial paralysis, and loss of the sense of taste on the anterior part of the tongue. It is known that the posterior auricular nerve is composed in part of fibers coming from the seventh, partly from the ninth and partly from the tenth nerves, in this respect resembling a nerve plexus, but the areas innervated by each nerve root have not yet been completely delineated.

The anatomical method of delimiting the cutaneous fields supplied by the lower cranial nerves is unsatisfactory. The various cutaneous filaments not only join together in a plexus, but the fields of the sensory roots overlap. Sherrington (12) showed that the cutaneous fields of the spinal roots overlap to a considerable degree so that two or even three roots may supply one particular cutaneous area, and that no area is rendered entirely anesthetic by the section of a single root. If the same condition obtains in the case of the cranial nerves, then two or more roots must be paralyzed (excluding of course the trigeminus), before a definite area of anesthesia can be determined.

The extent of the fields, as Sherrington noted, is best determined by the method of residual sensation, that is by outlining the area of normal sensibility after section of the roots of two nerves on each side of the root to be studied. A modification of this method is the study of the borders of the anesthetic area after section of two adjacent roots. The upper limit of anesthesia denotes the farthest extension caudally of the upper uninjured root, whereas the lower limit represents the farthest extension cephalad of the low uninjured root. Both of these conditions are seldom fulfilled satisfactorily in man. Practically speaking nothing is known about the backward limit of the cutaneous area supplied by the N. glossopharyngeus, nor the forward limit of that supplied by the N. vagus. These nerves are

practically always involved at the same time in the disease process. The excellent experimental method of Dusser de Barenne (81) of strychninization of the dorsal roots finds almost insuperable obstacles when it is a question of applying strychnine solution to the intracranial radicular fibers of the lower cranial nerves. I have attempted this without success.

Hunt (29, p. 338) believes that the zoster area will do much to establish the extent of these fields. "The importance of this method," he writes, "has already been demonstrated in the spinal ganglia by Head and Campbell, and how much greater would be its significance in the case of the geniculate; a small ganglion of unknown representation in which the cutaneous distribution was small, difficult of access and of demonstration by the usual anesthetic methods." This method also finds its limitations, for not infrequently more than one ganglion is involved, and the area covered by the eruption varies considerably. However, this is at present the most useful method that we have at our disposal. The method of residual sensation, the most exact, must not be lost sight of, for it will give certain valuable indications.

The following outline is only tentative, but is believed to represent the present state of our knowledge in regard to the dermatomeres of the head. It is drawn partly from the anatomical findings, partly from the zoster area, and partly from what observations we have upon residual sensibility. One original observation is included. As will be shown, the overlapping of the fields is considerable and is possibly more marked than is actually shown in the diagrams.

A. *Cutaneous Sensibility*

The N. trigeminus carries cutaneous sensory fibers for practically the whole face and a considerable portion of the scalp (Fig. 2a). There are considerable individual variations. In the parotid region there is a considerable extension upward over the border of the jaw, and a smaller one at the tip of the chin. It seems probable that the N. trigeminus supplies nearly all if not all the helix, antihelix, lobe and tragus of the external ear, the anterior wall of the external auditory canal, and the anterior half of the tympanum. These parts are certainly supplied by the N. facialis, but as a rule there is no definite anesthesia here resulting from paralysis of the N. facialis. This area is not supplied by the N. glossopharyngeus, for in Case 1, where the fifth and seventh nerves were both paralyzed, these portions were anesthetic.

We possess considerable information about the distribution of the various branches of the trigeminus upon the face. The ophthalmic

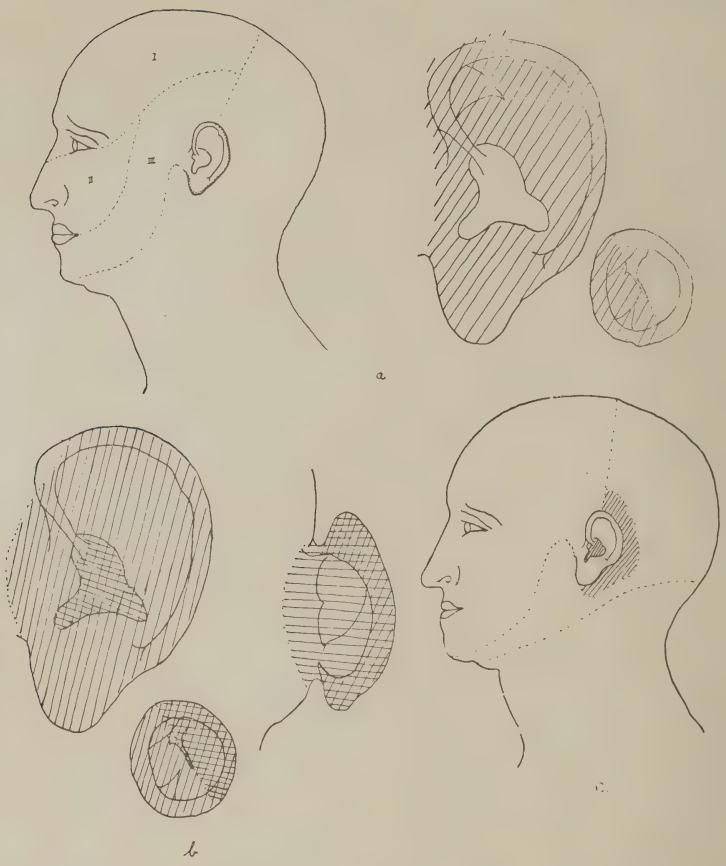


FIGURE 2. Dermatomeres of the human head. (a) The trigeminal field. The line on the scalp and side of the face is determined in cases of paralysis of the II and III cervical nerves as the posterior border of the sensitive area. The extension over the anterior surface of the ear is indicated by the following facts. This area is not supplied by the N. glossopharyngeus or N. vagus, because it is anesthetic in cases of paralysis of both fifth and seventh nerves (Case 1). However, this area retains its cutaneous sensation after paralysis of either fifth or seventh nerve separately. (b) The field probably supplied by the seventh and ninth nerves. The field of the VII (vertical shading) is determined by the eruption in cases of herpes oticus. Its anterior extension in front of the tragus is found in cases of trigeminal neurectomy. The extension to the posterior surface of the helix is of unknown extent. In cases of paralysis of both fifth and seventh nerves the concha and the posterior surface of the helix are sensitive showing that they are probably innervated by the N. glossopharyngeus (horizontal shading). The zoster zone for the N. glossopharyngeus includes a small area in the fissure between the auricle and the mastoid region. Its posterior extent is unknown. (c) The fields for the N. vagus (shaded) and the II c. segment. The intra-auricular portion is indicated by the reflex phenomena that are induced by irritation of the ear. The area surrounding the ear is the area supplied by the R. auricularis posticus. The II c. segment is fairly well known through studies on residual sensibility.

division supplies the scalp, the forehead above the eye, the cornea, upper eyelid and a portion of the nose. The maxillary division supplies the lower eyelid, the nose, upper lip, and a tongue-like projection of skin to the outer side of the eye. The mandibular division supplies the lower lip and chin, the cheek, the external ear and a not inconsiderable portion of the scalp.

The N. trigeminus by its position and distribution therefore, is situated at the oral end of the body and represents the most cephalic cutaneous segments. Probably, however, as is shown by studies on amphioxus and on the embryos of all vertebrates, the N. trigeminus represents more than a single segment. In the simpler forms of life the ophthalmic nerve is separated from the other portions, exists as

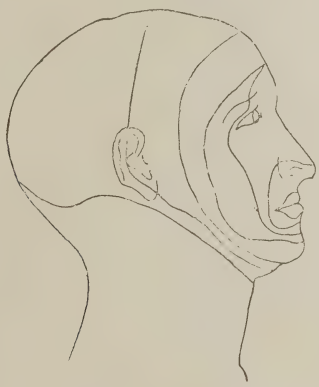


FIGURE 3. Segmental cutaneous innervation of the head as shown by the advance of the analgesic area in cases of syringobulbia. The most proximal portion of the body is shown to correspond to the mouth. (From Dejerine: Sémeiologie des affections du Système nerveux.)

a separate nerve, having its own sensory ganglion which becomes fused with the other portions only in the more highly developed organism. In its separate existence is lies close to the midbrain, but later becomes displaced caudally (Kappers, p. 318).

The cutaneous fields of the maxillary and mandibular rami are separated by the mouth. These two rami possessing a common ganglion are to be looked upon (Johnston) as derivatives of the pretrematic and postrematic rami of an early branchial nerve. From this point of view the mouth itself is a gill slit highly modified.

Whereas there is thus some evidence of the segmental distribution of cutaneous fibers in the peripheral distribution of the N. trigeminus, this evidence becomes much more convincing when the intracerebral distribution of the primary nociceptive fibers is examined.

These run in the radix spinalis trigemini and subserve a primitive kind of sensibility which might be termed paleoesthetic in contrast to the discriminative or neoesthetic kind. When the radix spinalis trigemini is destroyed progressively as in cases of syringobulbia, the loss of pain sensibility advances progressively over the head and converges upon the mouth (see Fig. 3 from Dejerine). This has led Winkler (14, Vol. 2, p. 10) to regard the cutaneous innervation about the buccal orifice to be as much segmental in character as that found about the anus. Thus we may consider, he shows, that the mouth is really the most anterior portion of the body, for the dermatomeres converge upon it, whereas the head and eyes are in reality developed from the portions caudal and dorsal to the mouth. In support of this theory Brouwer (16) has called attention to the fact that the N. ophthalmicus of fishes spreads out dorsally to the maxillary and mandibular divisions. How this primitive segmental representation remains in the radix spinalis trigemini while the cutaneous fields supplied by the several branches of the nerve have become so profoundly altered is a subject that will be taken up later in the consideration of the principle of usurpation.

Passing from the N. trigeminus to the N. facialis we find that it has been recognized clinically only recently that the seventh nerve in man contains cutaneous fibers. According to Winkler (Vol. 1, p. 386) " The glossopalatine nerve (the sensory division of the facial nerve) does not carry any more cutaneous fibers." Most authors, however, who have recently investigated the question believe that there is a small area of skin innervated by the sensory division of the facial nerve. The anatomical evidence is strongly in favor of it. The seventh nerve of certain fishes contains a considerable number of cutaneous fibers. These are diminished in other fishes but reappear prominently in the amphibia. In mammals Rinehart (32) has described a cutaneous sensory branch of the N. facialis in the albino mouse, and as noted above, Retzius, His, v. Lenhossek and more recently Baudouin (23) have found it in man. According to van Gehuchten (6, p. 596–602) the facial nerve is sensitive at the stylomastoid foramen. He speaks of the Nervus intermedius Wrisbergii " which is nothing else than the sensory part of the N. facialis."

Ramsay Hunt (28) believes that the cutaneous area of the geniculate ganglion is shown by herpes zoster of the auricle and external auditory canal. On page 77 (1907) he states: " Histological and embryological investigations of the past ten years have shown conclusively that the facial is a mixed nerve possessing an afferent or sensory portion, which is the nerve of Wrisberg, and a ganglionic

structure, the geniculate, analogous in structure to the spinal ganglia of the posterior roots, the cell type of the geniculate corresponding exactly to that of the spinal and gasserian ganglia." In 1909 Hunt (29) went even farther, showing that afferent fibers are found in all three divisions of the facial nerve, the chorda tympani, the great superficial petrosal nerve and the main motor trunk itself.

It is nearly twenty years now since Hunt called attention to the condition which he terms the syndrome of the geniculate ganglion, which is found in cases of herpes oticus. In this condition, as the result of a specific inflammation of the geniculate ganglion there arise herpetic vesicles covering the auricle and the external auditory canal, neuralgic pain in the same region, paralysis of the facial musculature, and loss of the sense of taste on the anterior two-thirds of the tongue. In one case Hunt found degeneration of the sensory division of the facial nerve at its entrance into the medulla oblongata. The number of recorded cases of this condition has been multiplied in recent years. Dejerine (4) discusses the condition in his Sémeiologie; Sterzi (11) and Herrick (9) admit the probability of cutaneous representation in the facial nerve, Kappers accepts Hunt's conclusions. Recently (Vol. 1, 1924) a series of communications on the subject of herpes oticus appeared in the Revue Neurologique.

The whole distribution of the cutaneous fibers of the seventh nerve is not known although some work has been done in this regard by Hunt himself and by others. In Dejerine's case of herpes oticus there was not only anesthesia of the auricle and the external auditory canal, but also a large area of marked hypesthesia in the whole area supplied by the posterior auricular nerve, and slight hypesthesia of the whole face on the same side. The large extent of disturbed sensation was possibly due to coincident inflammation of the peripheral nerve trunks. It is very doubtful if the cutaneous fibers of the facial nerve extend far beyond the auricle and the external auditory canal. The distribution of the eruption of vesicles in the cases of herpes would constitute a better criterion.

The anterior extension of the cutaneous sensory field is easily determined in patients on whom the avulsion of the posterior root of the Gasserian ganglion has been performed (Fig. 2-b). The posterior border of the anesthetic area is bounded by a line that runs a few millimeters in front of the tragus, and sometimes in front of the helix, though there are considerable variations in this regard. In cases where both the N. trigeminus and the N. facialis are paralyzed, however, there is definite extension of this anesthetic area, so that the anterior border or normal sensibility has retreated into the external

auditory canal and for a considerable distance over the auricle on its anterior or external surface. The concha remains sensitive, being innervated by the lower nerves.

The following case is a good example:

Case 1. J. G., male, aged fifty-six years. (From the Neurosurgical Clinic of the University Hospital, Philadelphia, Professor Charles H. Frazier, to whom I am indebted for permission to report the case.)

Diagnosis: Trigeminal Neuralgia. Radical operation of avulsion of the posterior root of the gasserian ganglion followed by facial paralysis.

Case History. For 18 months the patient had suffered from lightning pains in the left side of the face, chiefly in the cheek and lower jaw. His general health was good. There were no symptoms or signs referable to the other cranial nerves. Several teeth had been extracted without furnishing relief. Under ether anesthesia the posterior root of the gasserian ganglion was avulsed by Dr. Frazier. After operation there was complete anesthesia of the right side of the face including the cornea. The masseter muscles did not contract. Two days later there was complete flaccid facial paralysis involving all the muscles. Taste sensation was lost on the anterior part of the tongue. There was no sensation produced by pinching or by pressure upon the forehead, malar region or lower jaw. The tongue, gums, teeth, hard palate and anterior pillar of the fauces were insensitive to light and touch and pinprick. Unfortunately the pressure sense in the tongue was not tested at this time. The area of cutaneous anesthesia is shown in the photograph (Fig. 4-a). It includes the whole of the helix and lobe of the ear on its anterior or external surface. It is sharply bounded by the edge of the helix and does not invade the posterior aspect of the helix. Nor does it invade the concha, although the anterior wall of the external auditory canal as far as it was tested was anesthetic. The posterior wall was sensitive. The sensation of the tympanum was not tested.

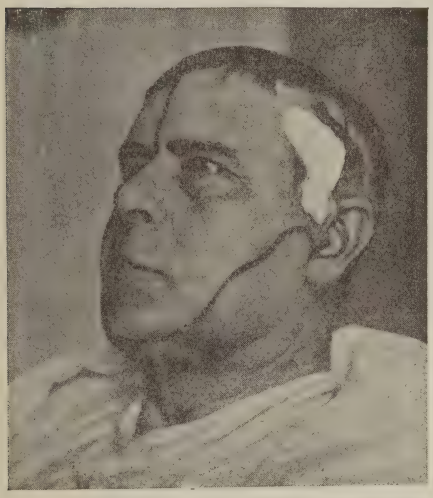
At no time were there any disturbances of deglutition or of phonation.

Seventeen months later, I again examined this patient. The facial paralysis had completely disappeared. There was no return of function in the muscles of mastication, which had undergone considerable atrophy. Taste was normal on both sides of the anterior portion of the tongue. Pressure sense was acutely felt on both sides of the tongue and over the face as well. Although no algometer measurements were made, pain was produced equally readily on the two sides of the face by deep pressure. The area of cutaneous anesthesia is shown in the diagram Fig. 4-b. The extension of the anesthetic area over the helix and lobe of the ear had disappeared, and the line of anesthesia had advanced considerably in front of the ear. The sensation of the whole of the external auditory canal was normal and equal on the two sides.

Sensation was lost in the tongue, gums, cheek and hard palate, but the

anterior pillar was sensitive in its lower portion, as were all portions farther in. The corneal and the nasolacrymal reflexes were absent on the side of operation. The general health of the patient was excellent, and except for having to wear protecting goggles he could attend to his business as well as ever.

This case tends to show by the method of residual sensibility that the sensory field of the seventh nerve includes the whole of the anterior surface of the auricle and the lobe of the ear. This area



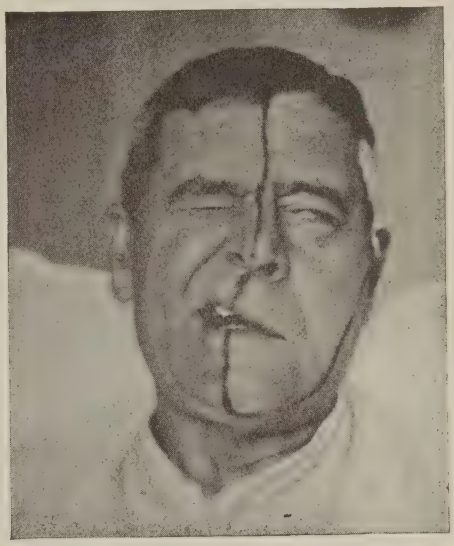


FIGURE 4-a. Photograph of John G. (Case 1), one week after avulsion of the roots of the fifth nerve. Facial paralysis of peripheral type developed soon after operation. The area of anesthesia is outlined. It includes the ant. or ext. surface of the auricle up to its post. margin, but it does not include the concha. The tragus and the ant. wall of the ext. auditory canal are anesthetic.

became insensitive after paralysis of both fifth and seventh nerves. It is not insensitive after paralysis of either the fifth or the seventh nerve separately, therefore it seems that this area is supplied by both the fifth and seventh nerves. This case also serves to show the anterior extension of the cutaneous field of the N. glossopharyngeus. When both the N. trigeminus and the N. facialis were paralyzed, the N. glossopharyngeus was the nerve situated the farthest forward, and therefore served to innervate the concha, the posterior wall of the external auditory canal, and the posterior surface of the helix. In the mouth the additional area of mucous membrane made anesthetic

by the paralysis of the facial nerve was not absolutely determined, but it seemed that the sensitive area over the lower portion of the anterior pillar was larger at the second than at the first examination. Tactile and pain sensibility had not returned to the tongue, although pressure was felt acutely on both sides, and taste had returned. This serves to show that the N. facialis carries only fibers for gustatory sensation to the tongue. The under surface of the tongue was not tested however.

The findings in regard to deep sensibility confirm Davis'(24) work.

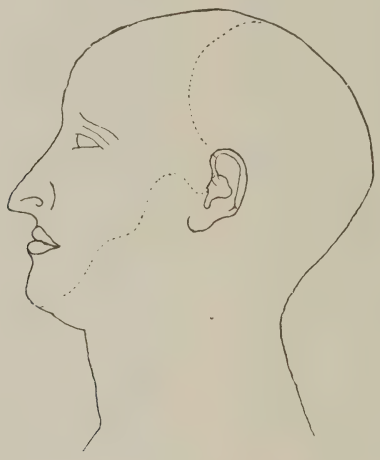


FIGURE 4-b. Anesthetic area after recovery from facial paralysis—17 months after operation. The anesthetic area over the scalp and cheek is somewhat reduced. The whole of the auricle except the root of the helix is normally sensitive. Pressure readings and other data are given in the text.

Our knowledge concerning the cutaneous area supplied by the N. glossopharyngeus is still less definite than that concerning the area supplied by the N. facialis. It is known that a small branch runs from the sensory root to join the auricular branch of the vagus. Before Hunt's reports, Cushing (17) had assigned to the glossopharyngeus and the vagus, a cutaneous distribution to the auricle and external auditory canal, but he did not take the N. facialis into account. In Hunt's papers some consideration is given to the possible rôle played by the N. glossopharyngeus in herpetic inflammations of the auricle. He states that in two of his cases the eruption of vesicles extended posteriorly to the cleft between the auricle and the mastoid region, and suggests that in these cases the Ganglion superius IX was also involved in the disease process. According to

Winkler the N. glossopharyngeus supplies sensation to a small cutaneous area behind the auricle. Kappers (p. 306) states that the ninth nerve has some cutaneous fibers which find their cells in the superior glossopharyngeal ganglion. It seems probable that the anterior limit of the cutaneous field supplied by the N. glossopharyngeus is outlined in the case reported (Case 1) in which both fifth and seventh nerves were paralyzed. Less convincing evidence is that supplied by the nature of the reflex phenomena that come about as the result of douching the ear. Swallowing is often provoked.

The N. glossopharyngeus thus probably innervates the posterior surface of the auricle and the cleft between it and the mastoid region, the concha and the posterior wall of the external auditory canal. This is indicated in Fig. 2-b. Further careful work is needed along this line especially upon patients who present what Vernet (42) has called the syndrome of the posterior lacerated foramen, exhibiting paralysis of the last three or four cranial nerves, before this question can be settled. From an anatomical point of view the statement of Vernet that the N. glossopharyngeus carries only motor fibers, and the N. vagus only sensory fibers cannot be taken as proven. Herrick (9) accords the glossopharyngeus a general sensory distribution to the auricle.

The N. vagus has a larger cutaneous field that is fairly well known through gross dissection of the branches of the posterior auricular nerve. This area is sometimes the seat of neuralgia, provoked by disease at other points in the distribution of the N. vagus. For instance in cases of carcinoma of the larynx there may be severe pain in the ear. In Vernet's Case 5 there was paralysis of the palate, pharynx and larynx on the right side with marked hyperesthesia in the same area. This patient noted that upon cleaning his ears, especially if he pressed upon the posterior wall of the external auditory canal, coughing was immediately excited. Less marked reflex phenomena are frequently noted. According to Kappers (p. 305) the vagus carries cutaneous fibers. They supply the skin of the auricle and external auditory meatus through the posterior auricular nerve and find their ganglion cells in the G. jugulare. According to van Gehuchten the ramus auricularis vagi comes from the G. jugulare, receives an anastomotic connection with the N. glossopharyngeus, penetrates the mastoid canal, anastomoses with a branch of the N. facialis and is distributed to the external surface of the tympanum and the skin of the dorsal and superior half of the external auditory canal (p. 553). Herrick believes that the vagus supplies the external ear with sensory fibers. The delimitation of

the field has not been worked out, so that at present we cannot say positively how much is supplied by each nerve. The schema in Fig. 2-b (from Dejerine) shows the distribution of the posterior auricular nerve behind the ear rather than a known sensory field. I have added the concha and the posterior wall of the external auditory canal on the basis of reflex phenomena.

The first cervical segment has no dorsal root. The second root has its ganglion and its cutaneous distribution that are well known through the work of Bolk (15) and of Cushing (17). Overlapping the cutaneous area of the trigeminus anteriorly to a slight extent, the field of the second cervical root extends backward over most of the scalp almost to the hair line at the root of the neck. Anteriorly it overlaps the portion supplied by the N. vagus through the posterior auricular nerve behind and above the external ear, and running beneath the lobe of the ear it invades the field supplied by the N. trigeminus in the parotid region. This has often been shown after section of the posterior root of the Gasserian ganglion. Often it takes in a small triangular area of skin at the tip of the chin. It is bordered and overlapped caudally by the cutaneous distribution of the third cervical root. This is shown in Fig. 2-c (from Dejerine).

The foregoing studies relate to tactile, thermic and painful sensibilities, that is to exteroceptive sensation. The distribution of pain fibers is always the largest, and in cases of anesthesia due to paralysis of one or more nerves, the analgesic area is always smaller than the area anesthetic to light touch.

B. *Deep Sensibility*

The clinical studies of Henry Head (7) and his collaborators upon sensation have clarified our knowledge of the peripheral mechanism concerned in the transmission of sensory impulses. Head divided sensation first into protopathic and epicritic sensibility, the fibers for which run in the sensory cutaneous nerves, and deep sensibility, the fibers for which run in the motor nerves. In the first examinations of his arm after section of all the nerves carrying cutaneous sensibility to a certain area, it was found that ordinary touches were not only readily felt, but quite accurately localized. Further investigation, however, showed that when the forearm was shaved, and when tactile stimuli were applied with care so as to cause a minimum deformation of the skin, such touches could no longer be felt. In this way he ascertained that the sense of pressure, of deep sensibility, was conveyed by the nerves supplying the muscles, joints, tendons and bones. This deep sensibility is therefore closely

related to the sense of position and passive movement, which are probably subserved by the same organs, and which compose the cognitive part of proprioceptive sensibility.

Before we consider this question, however, it is well to determine what we can in regard to the distribution of the sense of deep pressure in the various cranial nerves. All muscles have sensory end-organs, and motor nerves contain afferent fibers. In most cases the ganglion cells for these afferent fibers are to be found in the dorsal spinal ganglia and in their homologues the ganglia of the cranial nerves. There are certain exceptions to this. For instance although the oculomotor, trochlear and abducens nerves contain afferent fibers, no sensory ganglia have been described for them. The sensory ganglion of the N. hypoglossus is a curiosity that Froriep (46) has described. This investigator also found ganglion cells of sensory type in among the fibers of the N. hypoglossus, and these may be the ganglion cells supplying muscle sensibility to the intrinsic muscles of the tongue. Another exception is the N. trigeminus. The motor portion joins the mandibular division in the semilunar ganglion. As we shall see later the muscle sensibility of the muscles of mastication is carried by fibers which pass unchanged through the gasserian ganglion and, after entering the pons with the R. Sens. V, find their ganglion cells in the radix mesencephalica trigemini. This root has been shown by Johnston to be homologous with the series of sensory ganglion cells subserving muscle sensibility and occupying a dorso-mesial location in the spinal cord of the lower fishes which possess no dorsal root ganglia. Some evidence will be given tending to show that the afferent fibers in the third, fourth and sixth nerves also find their ganglion cells in this same mesencephalic root.

Fibers of deep sensibility for the face are carried in the facial nerve. One of the most remarkable contributions to this subject was made by Davis (24), upon anatomical, experimental and clinical findings. In the first place he repeated and confirmed the work of Amabilino. After section of the chorda tympani he found that four-fifths of the cells of the G. geniculatum degenerated, but that one-fifth remained intact. After section of the N. facialis at the stylomastoid foramen he found one-fifth of the nerve cells in the G. geniculatum in a state of chromatolysis, four-fifths remaining intact.

In further experiments Davis sectioned the posterior root of the G. semilunare in cats and found abolition of the corneal reflex and of other ordinary pain reflexes. However, when he thrust needle electrodes into the facial musculature and stimulated with the faradic

current, the animal cried out and struggled violently. Section of the N. facialis now abolished this reaction. In clinical cases of trigeminal neurectomy the same investigator found that the response to deep pressure was practically the same on both sides. In cases in which facial paralysis was associated with paralysis of the fifth nerve, however, there was no pain produced by pressure even amounting to 15 kilograms. This finding has recently been confirmed by Souques and Hartmann, and I have had the opportunity of examining a patient in whom, after trigeminal neurectomy, facial paralysis supervened (Case 1). These was loss of pain on deep pressure, but some months afterwards, when the facial paralysis had disappeared, deep pressure was felt equally on the two sides whereas there was in the same areas no return of cutaneous sensibility.

Quoting from Davis: "Applying Head's theory of the sensory mechanism in the peripheral nerves to the sensory supply of the face it would mean that the trigeminal nerve carries the afferent protopathic and epicritic impulses, while the facial nerve transmits the impulses of deep sensibility from the face." The fibers of deep sensibility that run in the N. facialis probably also subserve the kinesthetic sensation of the muscles supplied by the nerve. It is noticed (see the discussion of Davis' article) that patients with ordinary facial paralysis are not aware of the contraction of these muscles under stimulation by the galvanic current, although they can perceive the cutaneous sensation perfectly.

It is highly probable however that the N. trigeminus conveys some fibers for deep sensibility. Deep pressure upon the forehead is still painful in cases of common facial paralysis although there is a difference between the acuteness of the sensation on the two sides. After trigeminal neurectomy, pain is not produced by pressure upon the eyeball, and the oculocardiac reflex is absent upon the side of operation. The fibers of the fifth nerve transmitting deep sensibility probably come from the periosteum and the tunic of the eyeball. In addition there are others that give sensibility to the hairs, especially the moustachios which in the lower animals are highly developed and of considerable importance as exploratory organs. Sensibility of the dura mater may be grouped as deep sensibility and is carried to a large extent by the N. trigeminus.

The deep sensory components of the vagus and glossopharyngeus nerves probably serve for the conduction of deep pressure and kinesthetic sensations from the muscles innervated by these nerves. They probably belong more to the visceral than to the somatic type of afferent fibers. Indeed in this regard it might be said that the

deep sensibility of the muscles of the face and jaws belongs rather to the type of sensation known as visceral. The muscles under consideration are developed from the branchial musculature and are innervated by visceral motor nerves. However, the extension of voluntary control over these muscles has led to a change in their aspect. They have become striated, and the cells supplying them have assumed the morphologic characters of the somatic motor cells. It is probable therefore that the afferent fibers have come more to resemble the somatic afferent fibers, particularly those of a proprioceptive character.

The fibers for deep sensibility to the tongue probably pass by way of the N. hypoglossus. This opinion was given by Davis although Marburg (55) in his referate believed that they might reach the N. facialis through the chorda tympani. The former opinion is probably correct although I know of no direct evidence to support it. Case 3 reported below is suggestive in this regard but not conclusive.

It is stated (Dejerine) that the posterior portions of the dura mater are supplied by the vagus and hypoglossus nerves.

C. *Visceral Sensibility*

The N. trigeminus supplies general sensation to the mucous membranes of the lips, cheeks, gums and anterior part of the tongue and fauces. This would make it appear that the N. trigeminus is a mixed somatic and visceral sensory nerve whereas in the lower vertebrates it is preëminently a somatic sensory nerve, carrying few or no visceral afferent fibers. The explanation of the change may be that the alimentary canal, with its true buccal orifice, begins at the region of the fauces, and that the formation of the mouth is a later addition, a sort of portico built up in front of the main entrance. It thus develops that the fifth nerve, while primarily somato-sensory, comes to carry some fibers that have taken on a visceral function. In other words the visceral component is dependent upon the formation of the vertebrate mouth and is a secondary rather than a primary relationship. This question is discussed at some length by Johnston (8). Nevertheless as at present constituted, the N. trigeminus carries common visceral sensory fibers. It carries no taste fibers. As we shall see later the visceral sensory column is very well developed at the level of the sensory nucleus of the N. trigeminus.

The N. trigeminus also supplies sensation to the mucous membrane of the nares, septum, turbinates and accessory nasal sinuses at least as far as the ethmoid region. According to Dejerine (4) it supplies

also the sphenoid sinus. After section of the posterior root of the gasserian ganglion the nasolacrymal reflex is absent.

According to Ramsay Hunt (30) 1915, the N. facialis carries sensory fibers from the mucous membrane of the middle ear, eustachian tube and mastoid cells, Kappers follows Cushing and Oppenheim in ascribing to the seventh nerve the sensory fibers from the mucous membrane of the inferior part of the tongue and possibly the palate and the anterior pillar of the fauces. Winkler states that fibers of deep sensibility reach N. facialis from the palatal musculature by way of the sphenopalatine ganglion, but it is probable that these are mucosal fibers, because as Vernet has shown, there is no disability of the palate in cases of facial paralysis. He believes that the palate receives its motor supply from the spinal accessory nerve. The mastoid cells are believed by Dejerine to be innervated by the sensory branch of the vagus nerve. Hunt ascribes to the N. facialis the innervation of the internal ear.

The area of mucous membrane supplied by the N. glossopharyngeus is thus far poorly defined. Vernet even denies its existence after his investigation of a large number of cases in which the ninth and tenth nerves were paralyzed by injury or disease of the structures in the posterior lacerated foramen. It is highly probable according to van Gehuchten (41) that his nerve supplies common sensation to a small area of the tongue, the tonsil, posterior pillar and the pharynx, the fossa of Rosenmüller, the internal wall of the middle ear and the posterior wall of the Eustachian tube. There is a very marked difference in the reflex produced by touching the back of the tongue, the soft palate or the posterior wall of the pharynx on one hand, and the epiglottis or rima glottidis on the other. In the former case gagging is the normal result, while the least touch at lower levels provokes reflex coughing. This suggests an entirely different mechanism aroused, and it could best be explained by the suggestion that the peripheral terminations of different nerves have been stimulated. Deep muscular sensibility is supplied by the glossopharyngeus to the muscle it innervates, the superior constrictor of the esophagus (Vernet).

The visceral distribution of the N. vagus is by far greater than all the others, comprising as it does, the respiratory passages, the alimentary canal from the esophagus downward and the organs of the thoracic, abdominal and pelvic cavities. The mastoid cells and a part of the dura mater are included by Dejerine.

D. *Taste*

Taste is a specialized visceral sensation. The taste buds are derived from the entoderm, and the fibers supplying them run inseparably mingled with the fibers of general visceral sensibility. In man the chorda tympani branch of the facial nerve supplies the foliate papillae on the anterior part of the tongue, and the glossopharyngeus supplies the circumvallate and fungiform papillae on the posterior portion, together with some of the taste buds scattered in the wall of the pharynx. Some of these in the pharynx according to Winkler (V. 1, p. 400) may be innervated by the vagus through the superior laryngeal nerve, and Herrick (p. 160) states that those about the epiglottis and larynx are supplied by the vagus through the inferior laryngeal nerve. Practically speaking, however, though there is gustatory representation in the N. vagus, it is minimal. It has been proved conclusively that the N. trigeminus carries no gustatory fibers.

The foregoing consideration of the distribution and partition of the cranial nerves nerves is deemed desirable, for by this means we are enabled to see what sorts of fibers are carried by which nerves, and then in the consideration of the morphology of the central nervous system we shall attempt to account for the various physiological units in terms of anatomy. We know for instance that the gustatory fibers run in the VII and IX nerves, a few in the X, and none in the V. Therefore in the comparison of the reception nuclei of these various cranial nerves we shall be guided by these physiological considerations and shall attempt to identify the gustatory nuclei from what we know of the part played by the peripheral nerve in the transmission of gustatory impulses from the taste buds.

This is also one of the reasons why it is important to recognize the cutaneous distribution of the N. facialis, and to account for the deep sensory innervation of the face. It is only by a complete study of the physiology as well as the anatomy of the nerves and their centers that the rôle played by each can be ascertained.

II. The Entering Roots

After this rather extended consideration of the parts supplied with different kinds of sensation by the various cranial nerves it is necessary to take up the study of the course of the various types of fibers after they have passed through their respective ganglia and entered the substance of the central nervous system. There is a redistribution of the various elements of sensation in a different manner, a regrouping of the various sorts of fibers, and new and intricate relationships are encountered.

In the spinal cord the distribution of the individual posterior root is relatively the same at all levels, and is fairly well known as a result of the multitude of investigations that have had this knowledge as their goal. It is only through recognition of this distribution that we know where to look for fibers of the entering roots of the cranial nerves. In other words, the inductive rather than the deductive method of reasoning is followed in the subsequent chapters. We must bear in mind that although there are evidences of segmentation quite well marked in the brain-stem, this segmentation is obscured by (1) the alteration in size and shape of the neural tube; (2) the fusion of some segments and the obliteration of others; (3) the usurpation of the function of portions of several different nerves by another nerve; (4) the modification of certain nerve components to subserve special functions, *e.g.* taste; (5) the increasingly larger number of new and suprasegmental structures.

As a foundation for the study of the entering sensory roots in the medulla oblongata we can do no better than to review the course of the dorsal root fibers of the spinal cord. In the description given I follow Winkler, but consider the fibers rather from the point of view of the impulses they transmit than from their grouping in different fasciculi. The reason for this will become apparent when we consider the afferent roots of the cranial nerves.

The dorsal root fibers enter the spinal cord in a series of small fasciculi placed one above the other. Each fasciculus is composed of a smaller lateral, or as I prefer to call it a ventral division, and a larger mesial or dorsal division. The reason for the use of the terms dorsal and ventral is that in the brain-stem the great expansion of the dorsal portions of the neural axis has caused the dislocation of the entering roots from the dorsolateral surface to the ventrolateral. The homologue of the lateral branch entering the spinal cord therefore becomes the mesial branch in the medulla oblongata, and the mesial branch becomes the lateral one. At the risk of confusing the ventral and dorsal *sensory divisions* with the motor and sensory ventral and dorsal *roots* I think it advisable to use the terms ventral and dorsal *divisions* of the sensory *roots*.

The entering fibers of the dorsal roots divide upon entering the spinal cord in the zona marginalis into ascending and descending branches which sooner or later penetrate the dorsal horn although some of the ascending branches run by the dorsal funiculi all the way to the dorsal column nuclei.

(*To be continued*)

CASTRATION THREATS AGAINST CHILDREN

By E. Pickworth Farrow, M.A., D.Sc.
of Limehurst, Spalding; England

INTRODUCTION

Anybody who, as an adult, has had the startling experience of suddenly remembering quite clearly, after long-continued psychoanalysis, castration threats being made against him as a very small child, by overpowering adults, will want to do anything he can to avoid the incidence of similar threats against other children, perhaps his own, in the future. That is the sole object of the present article although the writer fears that his written style may not be clear enough for this task. Until the above very deep stage in analysis was reached, the individual may have taken only a very abstract theoretical interest, all along in analysis, in anything he may have heard about the castration-complex, and may have thought that nothing about it could possibly apply to himself, owing perhaps to what he believes to have been his very careful and guarded upbringing. Afterwards, however, it becomes a very different matter. The fright and worry following the conscious recollection are apt to be very great—possibly far worse than in the worst nightmare, largely owing to the fact that both the threats and the recollections happen in waking life, and there is thus no chance of escaping from them by waking up.

When the fright has been worked off by the individual realizing consciously—what he had never realized consciously before—that the threat was solely a threat and one not intended to be carried out, a great improvement in his health results, and he seems to have a different view of life from what he had had before.

Apparently the mind goes on thinking unconsciously about a castration threat, if given, until this is reached in consciousness again and removed by analysis. There is probably little doubt that the lives of a very large number of people have been ruined (in comparison with what they might have been) by these early castration threats in infancy, and that the resulting completely repressed fear is one of the chief underlying causes of nervousness and neuroticism. The matter is thus one of considerable psychopatho-

logical importance and in no sense one of impropriety, for we are here dealing with the deeper etiology of the neuroses.

It is possible that some unanalyzed persons might consider that the subject was unpleasant, but an analyzed person looks upon it simply from the point of view of a small child.

In the deeper stages of the analyses of adult male neurotics Professor Freud discovered to his surprise that a very high proportion of them eventually remembered threats made in their early childhood to cut off the genitalia as a punishment for, and deterrent against, infantile exhibitionism and onanism.

The recollection of these threats was invariably accompanied by very great horror, and emotional disturbance, which had previously been entirely repressed, and this repressed horror had frequently acted as a basis upon which the neurosis had subsequently been built up. In many cases it was clear that the neurosis would never have originated at all, and in other cases would not have been nearly so severe, if this repressed horror had not been present, or if the threats in question had never been made.

The severe complex associated with these childhood threats has been named, of course, the "castration-complex," and it is one of the features of Freud's discoveries which excites the greatest, or most widespread, doubt. The present writer at one time shared the general view. He considered the whole idea of the castration-complex to be extremely far-fetched and improbable. First he disbelieved in the commonness of the occurrence of the threats, and, secondly, when they did occur, he did not believe that they could possibly have such a bad and permanent mental effect as was stated. Some considerable time later he followed a method of self-analysis and was very surprised when he eventually clearly remembered, with very great horror, a severe castration threat which was made against him when about three and a half years old. An account of this particular threat, and of the stages by which it was recollected, has recently been published elsewhere.[1] A detailed account of the method of self-analysis employed has also recently been published.[2] The results obtained by this method of self-analysis are not open to the criticism that the analyst reads the alleged results into the mind of his patient.

The writer's skepticism was naturally more than shaken by this revived memory. There seems little doubt to him that the common

[1] See The International Journal of Psycho-Analysis, Vol. VI, Pt. 1, Jan., 1925.

[2] See The British Journal of Medical Psychology, Vol. V, Part II, 1925.

attitude of unreasoning skepticism concerning the castration-complex is frequently closely related to the fact that the majority of unanalyzed people themselves possess similar repressed fears, and thus wish to disbelieve in the existence of the complex. If any extremely skeptical person were analyzed, the unfortunate probability is that he would eventually remember, to his surprise and horror, a severe threat of this nature made in his infancy.

Wittels has a chapter on the subject in his recent book on Freud (Allen and Unwin) giving two useful references: viz., the chapter in Sadger's *Die Lehre von den Geschlechtsverirrungen* and Stärke's essay in the *Internationale Zeitschrift für ärztliche Psychoanalyse,* 1922. Wittel's chapter is, however, psychological rather than medical, and several points in it are probably unsound. For example, after referring to Freud's strong objection to the attempted introduction of phylogenesis, Wittels says "Nevertheless, the castration-complex cannot be saved without an extensive use of phylogenetic considerations." It may be remarked, in passing, that certainly nobody who knew anything about its effects would wish to "save" this particular complex from the point of view of saving it, but nevertheless Wittel's view can probably not be supported.

Careful observation and inquiries extending over some time, in a typical English provincial town render it probable that, on the average, not more than two, or at the most three, boys out of every ten escape some threat of this nature when between the ages of two and six years.

At one time, the writer would have thought this improbable but the threats are made owing to the following circumstances. The infant boy when he first consciously discovers or realizes the presence of the genitalia (sometimes as early as two years old) is almost invariably extremely proud of them. On account of this fact he will be inclined to exhibit them to adults and to other children. He will probably not perform this exhibition in the presence of either of the parents owing to the same fear which may have produced an earlier Œdipus complex; but he is more likely to do so in the presence of other people, particularly persons of the opposite sex, such as servants.

If the exhibition were made in the presence of a man, the latter would probably say, "You must not do that. It is considered very improper," and would probably smack the child if the act were repeated. Some men might make a cutting-off threat but they would probably only do so in a half-hearted way, feeling rather ashamed of themselves. Admittedly, some men apparently see humor in making cutting-off threats in a joking way to a child, but the lewd

attitude of mind which can see anything funny in a remark of this kind is difficult of comprehension by any sane person and such remarks naturally deserve strong condemnation. Nevertheless they would probably not have the very bad mental effects of apparently seriously intended castration threats.

Experience, however, shows that in relation to this particular matter women are in an altogether different class from men. Many women, especially unmarried women and servants, apparently have not the slightest conception of the extreme mental importance of the genitalia to the small boy, and experience shows that, if a small boy exposes himself in the presence of a servant, the latter is extremely likely to say, "If you do that it will be cut off" unless she has been specially warned not to do so. Probably this idea occurs to her merely as being the simplest and most likely method that she can think of for preventing the recurrence of the infantile exhibition and is without the slightest inherent viciousness on her part. All she wishes to do is to prevent the exhibition and she has not the slightest conception of the great mental harm which analysis would in all probability show as having been caused by this method. Otherwise she would certainly have adopted some other plan. As it is, the castration threats will probably be increased in severity until the desired end is attained by this particular process. For example, in the writer's case, a pie-dish and scissors were eventually produced by an unmarried cousin and a servant. It is unnecessary to dilate on the terrible nature of the fright which this caused, for even verbal threats have a very bad effect.

The horror which comes to the surface in psychoanalysis when castration threats in infancy are eventually remembered is so great that any cautious investigator would immediately be caused to wonder whether the individual may not be "reading back" into the early castration threats unpleasant emotion attached to many incidents in his later life. If this is not the case, it would probably be very difficult to prove this conclusively. Much evidence indicates, however, that the horror arises from the great mental importance of the genitalia and is properly attached to the castration threats as such, that it originates immediately after the threats, and is not "read back" from later unpleasant incidents. For instance, the improvement in health which follows immediately after the working off of the fright is one of the phenomena which indicate this.

If cases of severe psychosis, which are unanalyzable, owing to such characteristics as suspicion, excitement, stubbornness or silence, could be analyzed it seems very probable that repressed castration horror might frequently be found to have played an important part

in the etiology of some of the disorders, in the same way as has been found to be the case in the simpler conditions of the neuroses.

The chief difficulty in the way of avoiding these threats is that a child while he is between the ages of two and six years may be left alone with any one of many different persons. Most of these would doubtless not make a castration threat; but out of the number there is almost certain to be one who will, unless the child's infantile tendency to exhibitionism has been previously checked by some other method. It is in this way that the high proportion of adult males with various types of severities of castration complexes arises, viz., not less than seven to three.

Indeed, when one considers the strength of the early infantile tendency towards exhibition and handling of the genitalia; and the fact that, when this occurs, a cutting-off threat appears to be such a spontaneous reaction on the part of such a large number of adults, the proportion is probably far higher than this.

With regard to this matter, a scientific friend said to the writer recently "When one first hears of the castration-complex the idea seems to be quite impossible, but when one looks carefully into the matter, and considers the habits of small boys, one then sees, at once, that it is probably almost impossible for a small boy to escape a threat of this kind. However, I think that it is very sad if the human mind does not possess some ways and means of repairing the likely damage caused by these threats."

With regard to the latter point, it would appear that the human mind only seems able to endeavor to repair the damage by means of covering it over; and, in the absence of analysis, the original damage apparently remains in full force. This is possibly what might have been expected when the fright is so great that it is completely repressed in the mind and, in the ordinary way, is not available for alteration or modification. Some adults seem to think that children are almost lifeless objects with no intelligence and do not realize that they are usually extremely intelligent and complete small men and women.

In view of these facts it seems desirable that practitioners should warn the parents of small boys of the very great danger they incur in leaving them alone with unmarried women. They should not be left alone with anybody who has not been given definite instructions not to make mutilation threats against the genitalia. Servants should be told that, in the case of exhibition, the child is to be repeatedly told that this is very improper and that he must not do it; and that, if this fails, the fact is to be reported to the parents. It is, however, unfortunately, almost impossible to be certain that these instructions

will reach every person who may be left alone with the child—for example a relative or friend of a servant may be in the house. In view of this difficulty it might be advisable for the parents of a small boy to tell him, not later than the age of two, that he must not expose the genitalia in the presence of anybody. Also that if anybody ever makes a cutting-off threat against these parts, he is not to be frightened, for there is no possibility whatever of its being carried out, also that he is at once to report any such threat to the parents.

Psychological preventive medicine will probably ultimately acknowledge a great debt to the research method of analysis for having discovered the common occurrence of castration threats in infancy, and the very great permanent repressed mental damage which they cause. If only the incidence of these early mutilation threats could be reduced, a considerable reduction in the incidence and severity of those later disorders (both neuroses and psychoses) which have a purely mental basis might reasonably be expected to follow. A reduction in the number of cases which would be benefited by the painful, long and laborious, process of psychoanalysis would be eminently satisfactory, for there always will be far more such cases than analysts to undertake the work. It is also of course infinitely more sensible, and satisfactory, to prevent disorders rather than to attempt to cure them later when they have become complicated. It must be annoying to an analyst to have spent hundreds of hours of valuable time only to find that it would have been unnecessary, and the patient would have been in good health, if it had not been for the underlying completely repressed mental chaos and confusion caused in the patient's childhood by a castration threat made by some ignorant servant.

There is something psychologically unique about the genitalia which makes it extremely detrimental to threaten castration while a threat to cut off the nose, thumbs, or legs for example would do no, or very little, harm at all. In fact the writer knows of a case in which a threat to cut out the tongue (for impertinence) was mentally actually welcomed by the child as providing a means whereby he could displace fright arising from an earlier castration threat on to the tongue threat. The latter then acted as one of a long series of cover-memories each member of which helped to render the original highly unpleasant castration threat more completely unconscious than it would otherwise have been.

Deep analytic research rather indicates that castration phantasies and complexes may sometimes arise *ab initio* from the process of weaning from the mother's breast, and from various other causes—a sort of substituting or transferring process. These forms of the

complex, however, would not be likely to be nearly so severe as those forms which arise from specific threats and it is not the mere existence of a complex in itself which is important, but its severity and its relation to other tendencies in the individual mind.

Indeed, if those transferred fears which may possibly be derived from the weaning process are to be termed a castration-"complex," that which is produced as a result of actual definite and specific threats against the genitalia should certainly be known by a different name for the writer feels sure that there is no comparison whatever in the definiteness and respective intensities of the fears resulting from these two different types of causes. Before such a castration threat the individual may have a fundamentally fairly happy outlook upon the world; but after such a castration threat—if the threat is a severe one—the outlook upon the world may be fundamentally very depressed and miserable.

Only those who, as the present writer, can remember the details of a severe castration threat, and their respective attitudes towards the world before and after this threat, can realize what a fundamental change in his outlook on life a severe castration threat may produce in the individual.

The writer has been very impressed and interested to find that, since he "got up" and removed all the repressed horror formerly associated with his own castration-complex, occasionally when he is talking with some other individual about ordinary every-day matters, this individual may occasionally and for no apparent reason, suddenly begin to "shout" "castration-complex" to the writer—seemingly by perhaps only a slight but nevertheless peculiar and highly distinctive frightened and depressed look about the eyes, by his general manner and actions, etc.

This occasional phenomenon was so striking that, after it had occurred a few times, the writer began to wonder whatever the explanation or cause of it could be. He can only think that it must mean that some of the particular effects of the castration-complex in the directions indicated must be so highly specific, and that the writer, who had the effects of a bad castration-complex in his mind for about thirty years, is apparently inwardly so well acquainted with some of these very specific effects that now, after these effects have been removed from his own mind, when he occasionally sees these particular effects displayed in another individual, the matter forces itself upon his attention, no matter what he may have been thinking about just previously. Of course it would not do to argue from this that the other occasional individual necessarily has a castration-complex—such an attitude would not be nearly sufficiently

cautious and it would be unscientific—except possibly as a preliminary hypothesis. It is nevertheless of considerable scientific interest that the above phenomenon occasionally occurs in a striking manner. It is, in any event, very apparent to the writer that all physicians in charge of cases of mental disorder should preferably have been deeply analyzed.

It is clear that one moral which may be drawn from the facts stated in the writer's paper in the *International Journal of Psycho-Analysis* already referred to is the likely effects which such a very bad fright in infancy might have upon the development of subsequent mental disorder. The present writer considers it probable that such thoughtless, but terrifying " acted " castration threats in early infancy are probably far more common than might be supposed—for his cousin—while untruthful and possessing some other most undesirable characteristics, could not be generally described as particularly vicious. Indeed in some ways she was kindly enough.

The writer remembered the characteristics of the coarse plush-like table cloth of a yellowish green color, referred to in the paper just cited, at which the dressmaker was sitting, so clearly in the analytical recollection of the castration threat that he was sufficiently interested to inquire the technical name of this particular material at a local furnishing shop. He was informed that it is termed " Mohair."

About a year after getting up his own castration-complex, the writer gradually noticed, at odd intervals during a month or so, the existence of a tablecloth in one of the rooms in the house where he now lives which was *exactly* the same as the one which figured in the above analytical recollection. When, at the end of a month or so, he realized this fact fully consciously he was extremely interested. Nevertheless, wishing to be very cautious, and thinking that this particular tablecloth might possibly be a recent purchase, he inquired of his mother whether this was the case. However, his mother replied, " No, that tablecloth was bought at the time of my marriage."

Apparently the writer was only able to realize the existence of this tablecloth consciously after all the fright associated with the castration threat had become worked off his mind, and apparently it took nearly a year for this particular result to be achieved.

Thus this was apparently another instance of a mental blind-spot similar in nature to another one dealt with in the writer's article in the *Journal of Mental Science* (London), October, 1925.

All those who are doubtful of the effects of castration threats upon children should read Ernst Simmel's short but very valuable and interesting article upon this subject entitled "A Screen Memory *in statu nascendi*" in the *International Journal of Psycho-Analysis,*

October, 1925. Simmel's article is especially valuable because it is directly observational and does not depend upon psychoanalysis at all.

In it he describes the severe nature of the fright which a joking threat of this kind, on the part of a surgeon, produced in his small son at the age of two and a half years.

It will be realized of course that one is not in favor of infantile exhibitionism. The whole point is the great importance that it should be prevented by more rational methods than these unhuman cutting-off threats.

It is so obvious, for example, that severe smackings would be a far more sensible and appropriate form of deterrent. Admittedly they would give more physical pain and would not act so rapidly as the other method; but the great trouble, of course, about castration threats is that they penetrate so deeply into the mind, and are apt to do so far more than is intended.

Many large books on such subjects as "The Nervous Child" make no mention whatever of the effects of such threats. This omission seems merely funny to an analyzed person.

Doubtless the harmful effects of these threats to the individual child may be divided into two entirely distinct and sharply contrasted elements; (1) the fright in itself, and (2) the disappointment and injury consequent upon the non-fulfillment of the wishes associated with the infantile sexuality, and their repression, following upon, or as a result of, the fright. Doubtless (2) is unavoidable in a civilized community but physical pain might very sensibly be substituted for (1).

The great difficulty is that many unanalyzed adults themselves possess fairly severe castration-complexes. Owing to this they are themselves disinclined, or unable, to recognize the facts, and would be disinclined to take steps against such threats in the future. Such action would unconsciously remind them of their own repressed horror. Thus all the labor and pain of analysis will perhaps have to go on until people do eventually become convinced.

The counterpart of the castration-complex in the female—or rather those influences which tend to reduce its effects—cannot unfortunately be so readily dealt with in a civilized society as the incidence of the complex in the male might be avoided. There is thus not so much point in dealing with it here.

The writer is indebted to his friends, Dr. J. H. Power and Dr. J. Stanley White, for suggesting some improvements of literary exposition in this paper.

FACIAL DIPLEGIA IN MULTIPLE NEURITIS

By Albert B. Yudelson, M.D.*

ASSOCIATE IN NEUROLOGY, NORTHWESTERN UNIVERSITY MEDICAL SCHOOL; ATTENDING NEUROLOGIST, COOK COUNTY HOSPITAL AND WESLEY MEMORIAL HOSPITAL, CHICAGO

I

The incidence of facial diplegia in multiple neuritis is considered generally as unusual. In 1916 Hugh T. Patrick (1) reviewed the literature on this subject and recorded three cases in addition to twenty-nine previously collected. In only one of the three is given a history of a febrile illness prior to the onset of the palsy. No history of alcohol, metallic, or organic poisoning was present. The paralysis in the facial muscles was more severe than in the extremities and persisted longer. Difficulty in swallowing was present in one case. After an exhaustive discussion over the causative agents of generalized polyneuritis in which facial diplegia is present, this author suggests that there "seemed to be some special poison peculiarly noxious to the seventh nerve," and continues: "What this special agent or these special agents may be, if there be such, is matter for conjecture." The following study shows that he anticipated what was later proven to be a fact. A virus affecting the peripheral nerves, spinal ganglia, and the spinal cord has been found to be the etiological factor in the disease.

II

Gordon Holmes (63) had observed or obtained notes on about twelve cases of polyneuritis during the winter of 1917, among men from all parts of the British front in France. The symptoms and course of these cases were in all particulars identical with cases he had seen in London in civilian practice some years prior to the war. It is reasonable to assume that the illness in the soldiers was not due either to local conditions or exposure, for the number in the series was small and the distribution of the cases very extensive. None of the patients gave a history of alcoholism, organic, or metallic poisoning. Nor did the disease follow any known infection.

The onset in almost every case began with malaise and tempera-

* Read before The Chicago Neurological Society, February 18, 1926.

ture which ranged from 102° to 103° F. The subjective sensory symptoms such as pain in the legs and the lumbo-sacral spine appeared on the second or third day. Motor weakness in the lower extremities followed a day later. Then the arms became paretic, though less severely. About the same time the face generally became paralyzed bilaterally. Speech was unnatural and the patients "had some difficulty in swallowing." When the disease became fully developed, the flaccid paralysis, though incomplete, was bilateral and extensive. There was foot-drop and no movement of ankles or toes, but no atrophy or contractures. In other joints in the lower limbs there was feeble movement of small range. The intercostal and abdominal muscles were weak. "All groups of muscle supplied by the facial nerve are severely paralyzed." The face was expressionless and had all the features of bilateral facial palsy from the early days of the illness. The tongue, the vocal cords, or the larynx were not affected. "Almost all experienced more or less difficulty in swallowing solid foods." Diplopia was present in three cases: two were due to lateral rectus paralysis. In only one case was a feeble response of the patellar reflexes obtained. All other deep reflexes were absent from the early stages in the disease. The superficial abdominal and the cremasteric reflexes were present, but not the plantars in the patients whose lower limbs were severely affected.

Objective sensory tests showed prompt appreciation of touch, pain, heat and cold, and their location. Muscle and joint sense was impaired and vibration sense was delayed. Mentality was clear. No complications. There were no abnormal vasomotor, trophic, or secretory manifestations. Vesical sphincter disturbance was almost a constant finding in this series. In three cases the blood and spinal fluid were examined. Cultures could not be obtained in either. The spinal fluid showed no increased cell count nor any other abnormality. Thus, aside from the relative uniformity of the paresis, the fact that the proximal groups were affected almost equally with the distal segments of the feet and the involvement of some of the cranial nerves, especially the facial, and also the vesical sphincter, Gordon Holmes states: "The motor disturbances correspond closely to that of any other type of generalized peripheral neuritis."

Two of the patients died, one from bronchitis and one from bronchopneumonia. Recovery was rapid in the surviving men. Deglutitional and sphincter palsy disappeared first. The pain diminished and the restoration of muscle power followed. But weakness in the facial muscle generally persisted. Microscopic examination of the tissues obtained from the two fatal cases showed early state of

degeneration in the sciatic. "The myolin sheaths being broken up in spherical or oval globules." Some alteration in the anterior horn cells of the cord was visible. Some of the cells were slightly swollen, but there was no round cell infiltration. Similar but less marked changes were noticeable in the large cells of the motor cortex.

It is obvious from this series that the symptomatology of the disease, its course, and ultimate recovery point definitely to the diagnosis of febrile peripheral polyneuritis. In all these cases severe

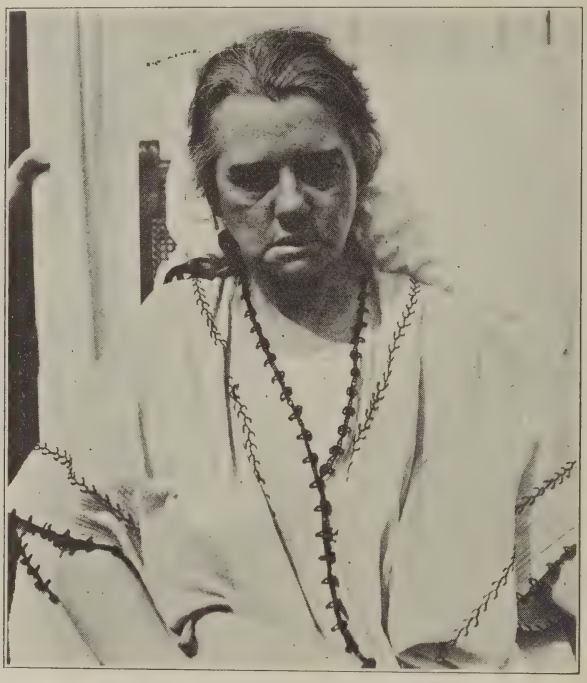


FIGURE 1. Patient at rest. Note the expressionless face and the drooping of lower lip.

facial diplegia was a constant feature. The post-mortem pathological findings prove equally conclusively that the infection affects not only the peripheral nerves but also the central nervous system in certain stages of the illness. The changes are not inflammatory but degenerative in character.

III

Sir John Rose Bradford (64) observed a series of thirty carefully selected typical cases of acute infective polyneuritis which, he says, present "all the leading phenomena of the disease." The study

was made on British troops in France and in Flanders during 1917. The clinical symptoms, which were constant and uniform in all cases in the series, were manifested by generalized palsy which is different in character and in distribution from other well known forms of neuritis. The palsy was progressive. Twenty of the thirty cases were examined by this author. Characteristic of the onset is a slight illness five or six weeks prior to the palsy. The onset is mild and transient, consisting of a diffuse headache and vomiting of short duration. In a small portion of the cases the symptoms were more severe. Pain in the back aggravated by movement and pain in the limbs appear later in the course of the disease. The pyrexia was slight in these cases, 100°–101° F. In a few patients 103°. The fever lasts two to four days, then there is a quiescent period, or a period of "latent infection," which lasts about six weeks, during which time the patient is well and free from any symptoms. Then he suddenly develops tingling and numbness, which is followed by palsy in two or three days. It seems that the severer the early symptoms the shorter the interval between them and the weakness in the legs, which is not really a complete paralysis, and which shows a tendency to improve after twenty-four hours. Headache and a slight rise in temperature may occur at the time of or simultaneously with the palsy. The motor weakness is ascending in character.

In Bradford's cases the involvement was greater in the proximal than in the distal segments. Patients who were unable to move the hip or shoulder joints were able to move their toes and fingers freely. The paralysis was symmetrical in its distribution, though not equal bilaterally, nor of the same degree in all the cases. Not individual muscles or muscle groups are affected but the whole limb. In the severe cases the muscles of the trunk, chest, and abdomen, and even the neck, may show a flaccid paralysis. Facial diplegia was practically a constant finding in this series. "In fourteen out of seventeen cases the palsy was known to be bilateral in its distribution at the same period of the illness." It appeared some days after the legs had become paralyzed. One side was affected first and the other two or three days later. There was no atrophy or contractures.

There was incomplete sensory loss corresponding to the cutaneous distribution of some spinal roots.

The tendon reflexes were lost when the disease had reached its full development. The superficial reflexes, excepting the plantars, were obtained. Sphincters were not involved. There was tachycardia, 100–120, without fever while the patient was in bed. Mentality was clear. A slight albuminuria was present. Leucocytosis,

12,500–19,000, was found. No abnormal cells present. Spinal fluid, obtained under normal pressure, was "limpid" and otherwise normal. Klebs-Loeffler bacillus was not found in the throat of any of these cases, nor was a history of alcohol or metallic poisoning given.

Complete recovery was slow, about six months. In a series of thirty cases death occurred in eight in from five to twelve days after the onset of the palsy. The cause of death was attributed to weakness of the pulmonary muscles and the diaphragm, though no case of massive collapse of the lung was found.

FIGURE 2. Patient trying to close her eyes tightly. The left eye remains open wider than the right.

Seven out of the eight fatal cases came to autopsy. Edema of the brain and general visceral congestion were the only naked-eye post-mortem findings. No adenopathy was observed, except some mediastinal enlarged and soft glands.

The morbid anatomy of six of the eight fatal cases was examined by E. F. Bashford,(65) who makes the statement that "the *sectio cadaveris* of itself did not explain the fatal issues." The brain showed great congestion of the dural vessels, edema of the pia-

arachnoid and small congested vessels in the white matter. The cord showed marked venous engourgement.

Microscopic examination of the cord showed minute and widely diffuse hemorrhages in the dorsal enlargement and extensive interstitial cellularity in the cervical and lumbar enlargements. The central neural canal showed proliferation of the ependymal cells. The nerve cells in the cervical and lumbar enlargements appeared greatly reduced in number in the anterior horns and the posterior columns, and the tract cells at various levels on one side or the other. Characteristic of the pathology was its irregular distribution. In the long series of serial sections examined it was not possible to observe that the lesions were limited to any area of the gray matter of the cord. Occasional tract cells were degenerated and shrunken.

The cervical posterior root ganglia revealed practically no abnormality, while the dorsal and lumbar posterior root ganglia showed shrunken nuclei and vacuolation of the cytoplasm in the cells.

In the brain nothing was found beyond a slight degree of round cell infiltration around some cells of the motor cortex. Similar findings appeared in the cerebellum and in the pons. The voluntary muscle fibers showed degenerative changes similar to the nerve.

The pathology appears to be due to a septicemia which enters the nervous system by way of the nerve trunk and is marked by a degeneration of the peripheral nerve fibers first and involvement of the spinal root ganglia and the spinal cord later, without predilection for or selection of any special tracts or levels in the cord, and with an irregular distribution of the pathologic process within its sphere of invasion.

Bashford transmitted the disease experimentally from man to monkey and from monkey to monkey by subdural inoculation of an emulsion of the human cord of a fatal case and from the fresh cord of the first monkey to another. Also by inoculation of a pure culture. The onset of the transmitted disease, the symptomatology and pathological findings in the experimental animals which were killed or died were identical with those in man. The illness was milder in some animals than in others. This work proves conclusively the infective nature of polyneuritis and that the symptomatology is a manifestation of the degree and progress of the ascending infection.

IV

J. A. Wilson (66) isolated the virus of infective polyneuritis from the two human cords of Bradford's patients and from monkeys inoculated with an emulsion of these cords, prepared by Bashford.

Manifestly, the organism is widely distributed in the nervous system, for it is easily recovered from the cerebral cortex. This is especially significant because in none of the cases were mental changes noted. The organism is a strict anaerobe 0.2–0.5 μ in diameter, rounded, oval, or kidney-shaped; arranged in pairs, groups of 5–8, or rarely in chains of 3–5. It is stained with Loeffler's polychrome blue for twenty minutes.

FIGURE 3. Patient is unable to drink without folding her lower lip between her fingers while pouring fluid into the mouth and throwing the head backwards in swallowing.

The constancy of facial diplegia in all of Gordon Holmes' cases and in the large majority of Bradford's cases speaks not so much for the vulnerability of the seventh cranial nerve as for the aptitude of the infection to invade motor nerves, cranial nerves among them. The disease being of an ascending character, the involvement is a question of extent rather than that of degree. In cases where the facial is not involved, it is probably because the disease has subsided before it reached the cranial nerves.

It is true that in many cases the quadriplegia is mild and the facial diplegia is intense. Indeed, in all cases of diplegia facialis in

febrile polyneuritis the facial paralysis persists a long time after the palsy elsewhere has cleared up. But the researches of Marie, Meige, and Gosset (67) have clearly shown that certain peripheral motor nerve fibers have their individuality. The seventh having the largest purely motor distribution of any other cranial nerve, it is possible that it is more generally affected in infective polyneuritis because of its individual vulnerability to that infection, but not to metallic or organic poisoning. If exposure is a factor, as is shown by some authors,(62) the face is certainly most liable to palsy. Bradford thinks that it is quite exceptional for facial palsy to be really absent in infective polyneuritis. There is always a general weakness of the facial muscles. The palsy being bilateral, it is overlooked because there is no marked facial asymmetry.

The case to be presented, which is one of infective polyneuritis, is illustrative of the variation in the modes of onset of this disease as well as the degree and extent of the infective process as manifested by the symptomatology and the course of the illness.

Case X. A white woman, forty-five years old, married eleven years, was admitted in a wheel chair to Wesley Memorial Hospital, July 22, 1925. She was unable to walk because of weakness in the legs and severe pain in the feet. The pain alternated with numbness and hot and cold sensation in both feet. Family and personal histories unimportant. No history of alcohol, metallic, or organic poisoning could be elicited. Patient had a mild attack of influenza in January, 1925. She recovered completely after a few days. About the last of February she attended a curling game in a small town in Saskatchewan, and was chilled through. Diarrhea followed the same night and continued for a few days. It recurred and lasted for about a month, causing a loss of about fifteen pounds in weight. She improved, felt well, and regained weight until about the middle of May. While housecleaning she felt pain in the lower limbs from the heels up to the hips, worse at night, but was able to walk. Late in May the patient had a chilling sensation in her feet which lasted two hours. The feet felt numb for a few days after that. The gait was slow and uncertain. She turned her left ankle one day in walking. Weakness in the legs continued till the middle of June, when extreme pain set in in the hips, legs, and feet. The pain was so severe that she could not walk nor move her limbs freely.

About the last of June, or the first of July, she noticed that the right side of the face was drawn upward and the left corner of the mouth drooped. Two days later the right side of the mouth also drooped. The face became symmetrical, but the patient could not close her eyes or mouth completely, speak plainly, move her lips or any facial muscles. The lower lip dropped, so that when trying to drink the patient had to hold the lip between her thumb and index finger and pour the fluid into

the mouth. Deglutition was not involved. The patient stated that she ran a temperature in February when she had the diarrhea, but she did not know how high the fever was.

When first seen in the hospital there was a complete bilateral facial paralysis. The patient could not wrinkle her forehead, frown, or completely close her eyes. The left eye remained open wider than the right. The lips were motionless when she spoke. Labials could not be enunciated. The mouth was partly open all the time. She was unable to drink without folding the lower lip between her fingers while pouring fluid into the mouth and throwing the head backwards in swallowing. Laughing, whistling, or puffing out the cheeks produced no contraction of the facial muscles. The naso-labial folds were flat and the face completely expressionless.

None of the other cranial nerves was involved. The sense of smell was acute to mild aromatics. Vision was normal with glasses which the patient had been wearing for the past several years. The fundi were normal. The pupils were circular, equal, active to light, and in accommodation. No diplopia or nystagmus. The corneae were sensitive to the slightest touch. The conjunctivae were slightly inflamed and lacrimation free. Mastication was strong; lateral motion of the lower maxilla was free and ample. The jaw jerk was present. There was appreciation of sensation to all stimuli to the distribution of the fifth cranial pair. Taste was not impaired. Hearing was normal bilaterally. The tongue protruded fully without deviation. The palate rose well and gutturals were clearly and strongly uttered. Phonation was clear and deglutition was not involved. The pulse was regular but rapid, on the least exertion 100–110, returning to 80–85 at complete rest. No vasomotor disturbances. The temperature was normal during the patient's entire stay in the hospital. Respiration ranged between 20 and 24. No adenopathy or localization focus of infection was found.

There was no evidence of palsy in the muscles of the neck, the shoulder girdle, or the upper extremities in any muscle group. Myodynamometric pressure with the right hand was 42; left 37. Digital movements were quick and accurate. Coördination was faulty in both arms. No tremors or past pointing. Stereognosis intact. Provoked myotatic irritability over the shoulders and deltoids was present but not marked.

All movements in the lower extremities were slow and weak in active and passive motion from the hip girdle to the toes, especially the flexors. Rotation and adduction was good. Abduction weak. The ankle joints were weakest in dorso-flexion. There was marked footdrop bilaterally, more prominent in the left. Muscle and joint sense was disturbed. Heel-to-knee test showed marked ataxia. Distance between two points of the compass was not recognized within 15 cm. over the lower half of the thighs, and not at all over the legs, where tactile sensibility was also disturbed. No ataxia in the Romberg position. No atrophies. All superficial reflexes were present and equal. The plantars were abolished.

Deep reflexes in the upper extremities were equally present, though subdued. In the lower limbs, neither the knee nor the Achilles jerks could be elicited under reinforcement.

One week after the patient entered the hospital she complained frequently of numbness and pins-and-needles sensation in the finger tips bilaterally. No pain. The pain was very severe in the legs and the feet. The weight of bed clothes or light pressure on the muscles of the lower extremities from the lower thirds of the thighs downwards was very painful, especially the flexors, where direct myotatic irritability was increased. The lower down, the worse the pain. Tactile sensibility was impaired over the pereneal area in the left leg. There was delayed sensation to pain and tactile anesthesia over the dorsum of both feet. Pin prick was dull distally and over the toes.

The facial muscles did not react to a quite strong faradic current, nor to galvanism at first. But on the thirteenth day the reaction to the galvanic current was noticed. Similar electric phenomena were seen in the tibialis anticus muscles, except that response to galvanism was noticed on the ninth day. The muscles of the upper extremities reacted normally to both currents from the start.

The urine was entirely normal. The blood showed 4,890,000 reds and 11,700 whites with a normal differential. Blood Wassermann negative. Lumbar puncture was refused. Blood cultures were not made.

Nonprotein nitrogen.	.30
Urea-nitrogen.	.19
Creatinine.	1.87
Uric acid.	4.07
Blood sugar.	.130

The pain in the feet ceased on August 20th, about one month after the patient entered the hospital. She can stand alone. August 24th the patient walked unassisted, slowly. August 28th patient walked up and down eight steps. No pain in the feet. September 5th patient walked freely without pain. She can slightly wrinkle her forehead. She can drink without holding up her lower lip. Labials cannot be enunciated. She left the hospital on this date.

September 21st, patient can close both eyes tightly. Gait is steady and more rapid. October 10th, dorsoflexion in both feet is strong. Facial expression is much improved. Lips are still motionless when speaking and labials cannot be enunciated. October 30th, naso-labial folds are marked. Patient can whistle slightly. November 27th, knee and Achilles reflexes are readily elicited under reinforcement. Lips are still weak and labials are indistinctly enunciated. January 13, 1926, deep reflexes in the lower extremities are practically normal. Plantars are present. The face is more expressive, especially when the patient laughs. She still is unable to puff out her cheeks because the lips are weak. Enunciation of labials is indistinct, but patient can close her mouth and lip movement is distinctly noticeable when she speaks.

Conclusion

1. This is a case of infective polyneuritis.

2. Facial diplegia is a usual finding at some stage of this type of polyneuritis.

3. Infective polyneuritis is not to be classed with peripheral neuritis without neuritic involvement.

BIBLIOGRAPHY

1. Patrick, Hugh T. The Journal of Nervous and Mental Disease, Vol. 44, No. 2, August, 1916.
2. Laurans, Aime. Des Dipleges an Cours des Polynevrites. Thése de Paris, 1908. The references 3–21, inclusive, are cases collected by Laurans and from 22 to 62, inclusive, literature quoted by Patrick.
3. Pierrson. Arch. gen. de Med., 1867, Vol. 10, p. 296.
4. Barwinkel. Arch. f. Heilkunde, 1867. Cited by Pierrson.
5. Strümpell. Neurolog. Centralblatt, 1889, p. 601.
6. Althaus. Lancet, March 28, 1891. Deut. med. Wochens., 1891, 1086. Two cases. First one is that of Strümpell.
7. Havage. Rev. de Med., 1891, p. 139.
8. Bonnet. Contribution a l'Etude des Nevrites peripheriques infectieuses aigues. Thése de Lyon, 1892.
9. Do.
10. Do.
11. Preobrajenski. Memoires med. de Moscow, 1894, No. 3. Rev. Neurol., 1894, p. 234.
12. Tragowla. Rev. Neurol., 1894, p. 465.
13. Bregman. Neurolog. Centralbl., 1896, Vol. 15, p. 242.
14. Bernard and Braun. Lyon Med., 1898, December 18. Rev. Neurol., 1899, p. 571.
15. Raymond. Nouvelle Iconographie de la Salp., 1899, p. 1. Clinique des Mal. du Syst. Nerv., 1898–99, p. 606.
16. Sinigar. British Med. Jour., 1899, July 15, p. 138.
17. Do.
18. Cestan and Barboneix. Gazette des Hop., 1900, June 28.
19. Raymond. Les Progres Médical, Vol. 14, 1901, July 27, p. 49. In the thesis of Laurans this reference is incorrectly given.
20. Mirallie and Plantard. Rev. Neurol., 1906, Vol. 14, p. 480. Reported in detail by Laurans.
21. Westphal. Quoted by Laurans from thesis of Diemer (Paris, 1900). Published in St. Petersburg med. Wochens., 1890, no. 21.
22. Buzzard. Transactions of Clinical Society, Vols. VII and XIII.
23. Do. Clinical Lectures on Diseases of the Nervous System, London, 1882, p. 301. Lancet, 1885, November 28, December 12 and 19.
24. Remak. Nothnagel's Specielle Path. u. Therap., Vol. II, p. 344.
25. Lewandowsky's Handbuch., Vol. II, p. 88.
26. Grasset and Rauzier. Maladies du Systeme Nerv., 1894, Vol. II, p. 457.
27. Ross and Burry. On Peripheral Neuritis, London, 1893.
28. Gowers. Diseases of the Nervous System, Vol. I, London, 1899.
29. Jolly. Berlin klin. Wochens., 1894, No. 12, p. 281.
30. Crouzon, Chatelin and Athanassin-Benisti. Rev. Neurol., 1914, p. 592.
31. Eisenlohr. Berlin klin. Wochens., 1887, p. 781.
32. Pierson. Volkmann's Sammlung klin. Vorträge, No. 229. Innere Med., No. 79.
33. Langdon. Journal A. M. A., Vol. 44, p. 216.
34. Strümpell. Deut. Arch. f. klin. Med., Vol. 64, p. 146.
35. Singer. Prager med. Wochens., 1887, p. 143.
36. Raymond. Jour. de Méd. et de Chirurg. Pratique, 1903, p. 330.
37. Rhein. Jour. Nervous and Mental Disease, 1913, p. 528.

38. Minkowski. Arch. f. Psych. u. Nervenk., 1891–92, Vol. 23, p. 586.
39. Darkschewitsch and Tichnow. Neurol. Centralbl., 1893, p. 329.
40. Dejerine and Theohari. Semaine Méd., 1897, p. 453.
41. Mirallie. Rev. Neurol., 1906, Vol. 14, p. 702. Reported in detail in thesis of Laurans.
42. Alexander. Arch. f. Psych. u. Nervenk., Vol. 35, p. 778.
43. André Thomas. Rev. Neurol., 1907, p. 1273.
44. Oppenheim. Lehrbuch der Nervenkrankheiten, Berlin, 1913.
45. Crouzon. Un cas de tetanos céphalique avec diplegie faciale. Rev. Neurol., 1900, Vol. 8, p. 402.
46. Rolleston. Rev. of Neurol. and Psych., 1906.
47. Oppenheim. Berlin klin. Wochens., 1887, p. 781.
48. Brasch. Neurol. Centralbl., 1891, p. 260.
49. Baudoin and Chabrol. Rev. Neurol., 1910, Vol. 19, p. 124.
50. Ingliesi. Rif. Med., 1892, VIII, No. 257.
51. Levy. Contribution a l'étude des diplegies faciales totales, Thése de Paris, 1902.
52. Barkas. Lancet, 1895, I, p. 217.
53. Lunz. Deutsche med. Wochens., 1894, November 22, p. 886.
54. Gaspero. Aertzl. Centr. Zeitung., Vienna, 1902, Vol. 14, p. 393.
55. Popoff. Neurological Monitor (Russian), 1907, Fasc. II.
56. Marinesco. Roumanian Neurol. and Psych. Soc., May 27, 1907.
57. Meluzoff. Voyenno Med. Jour. (St. Petersburg), 1914, 1c. 34 Med. Spec. p't, p. 53.
58. Arzumanoff. Jour. Neuropat. i. Psikhiat Korsakova (Moscow), 1910, Vol. 10, p. 525, and Obozr. Psichiat. Neurol. (St. Petersburg), 1910, Vol. 15, p. 676.
59. Bruzelius. Zentralblatt f. Nervenk., 1887, p. 628.
60. Strube. Inaug. Dissertation, Berlin, 1881.
61. Darkschewitsch. Neurolog. Centralbl., 1898, p. 99.
62. Rosenow. Etiology of Acute Rheumatism, Articular and Muscular. Jour. of Infectious Dis., January, 1914, p. 61.
63. Holmes, Gordon. British Med. Jour., July, 1917, ii, 37.
64. Bradford, J. R. Quar. Jour. of Med., Vol. 12, p. 79, October, 1918. January, 1919.
65. Bashford, E. F. Quar. Jour. Med., Vol. 12, p. 104, October, 1918, January, 1919.
66. Wilson, J. A. Quar. Jour. Med., Vol. 12, p. 119, October, 1918, January, 1919.
67. Marie, Meige, and Gosset. "Les localisations motrices dans les nerfs peripheriques," Acad. de Medecine, December 28, 1915.

MALIGNANT HYPERNEPHROMA COINCIDENT WITH ARTERIOSCLEROSIS IN CHILDREN *

By Robert Richard Dieterle, M.D.

ANN ARBOR, MICHIGAN

This paper constitutes a more detailed histopathological description of Hoag's case (1), the brain of which was received for examination in this laboratory shortly prior to his clinical report from the Pediatrics Department of the University Hospital. Since that somewhat hastily prepared examination which was made for Hoag's article, a more thorough and extensive study of this brain has been completed. It was, therefore, deemed worth while to report these findings under the above title because of the few cases of like nature found in the literature. On account of the present trends of interest concerning the glands of internal secretion, and since specific glandular therapy has contributed to our knowledge of certain morbid endocrinal diseases, it was thought that it was not unscientific to infer that a hypernephroma, theoretically producing an overabundance of specific secretion, might be the direct factor in producing the arteriosclerotic softening of the brain in this case; for in the field of the strikingly abnormal there may be an accentuation of functions called pathological, which, perhaps, can throw some light upon normal functioning.

The case is that of K. T., aged four years and three months, who was brought to the University Hospital because of convulsions alternating with a semistuporous condition. A month prior to admission she was suddenly attacked with a unilateral convulsion with unconsciousness lasting three hours. A second attack followed a month later. Following a third one she remained semistuporous.

In this short abstract of the clinical examination from Hoag's article and for the report it is necessary to mention only a few of the salient points. The blood-pressure was 145–160 systolic and 90–100 diastolic. The blood count was normal and the spinal fluid negative.

A clinical diagnosis of malignant hypernephroma with sexual pre-

* From the State Psychopathic Hospital, Department of Neuro-Pathology, Ann Arbor, Michigan, through the courtesy of Dr. D. M. Cowie of the Department of Pediatrics, University Hospital, from which a clinical report of this case was made by Hoag in American Journal of Diseases of Children, Vol. 25, pp. 441–454, June, 1923.

cocity was made. The X-ray examination verified the presence of an abdominal tumor and accordingly, surgical operation revealed a large tumor mass lying retroperitoneally and covering the upper pole of the right kidney. Pathological diagnosis by Dr. Warthin confirmed the clinical diagnosis of malignant hypernephroma. The mass was incapable of removal and in spite of blood transfusion the patient died.

Necropsy data (Drs. Warthin and Weller)—The panniculus was 3 cm. thick over the pubes. Section of the breasts showed no glandular tissue. The thymus was very small, showing fibroid atrophy; the corpuscles of Hassal were quite numerous. The heart showed no pathologic changes except a slight right-sided dilatation. The pleura was not adherent. The lungs were studded with numerous nodules, those beneath the pleura varying from 0.5 to 1.5 cm. in diameter. These were sharply circumscribed, soft, yellowish, neoplastic masses, which on section resembled medullary carcinoma, although the general architecture was slightly suggestive of suprarenal cortex (malignant hypernephroma). The lungs were edematous and congested. The thyroid was small, the colloid abundant. The gastrointestinal viscera and adnexia were normal except for slight hyperplasia of the lymph nodes and Peyer's patches. The left suprarenal was thinner than normal, and on section appeared hypoplastic. The situation of the right suprarenal was occupied by a large neoplastic mass, measuring 10 cm. in greatest length, 6 cm. in width and 5 cm. in thickness, notwithstanding the fact that part of it had been removed surgically. This mass was retroperitoneal, but had elevated the peritoneum sufficiently to cause its attachment to the under-surface of the liver. The kidney had been pushed downward and was uninvolved in the new growth. On macroscopic section, normal suprarenal tissue was not found. The mass was friable and necrotic in most places, but the firmer portions were light yellow, with a fatty appearance. Microscopically, some areas resembled a suprarenal cortex. The atypical portions more closely resembled a medullary carcinoma, but many of the cells contained lipoids. Some areas showed a marked perivascular arrangement of the cells, more like an angiosarcoma. The kidneys showed cloudy swelling and acute congestion. The vaginal orifice admitted the finger with slight difficulty; the vaginal canal measured 6 cm. in length. The uterus was undeveloped, measuring 3 cm. from fundus to external cervical os. The ovaries were free, 2.0 by 0.5 cm., and showed on section an unusual number of large cystic follicles, but no evidence of menstruation.

Examination of Brain.—The brain had been hardened in 10 per cent formaldehyd for nine days. It had a length of 16.2 cm. and a breadth of 12.8 cm. In volume, it gave the impression of being larger than usual for a child of this age. The pia mater was clear, with slight congestion of the larger veins. The convolutions of the convexity were normally formed but had not reached full development. In a few places, there were small areas in which the surface of the convolutions appeared softened.

The base of the brain showed erosions of the tip of the temporal

lobe from mechanical injuries during its removal. The basilar artery was partly filled with blood clot. At a point about 1 cm. from its bifurcation, there was a small patch of thickening of the artery wall.

Vertical sections of the brain showed no gross abnormalities aside from the small areas of superficial softening. In these, the cortex appeared macerated and separated easily from the underlying white substance.

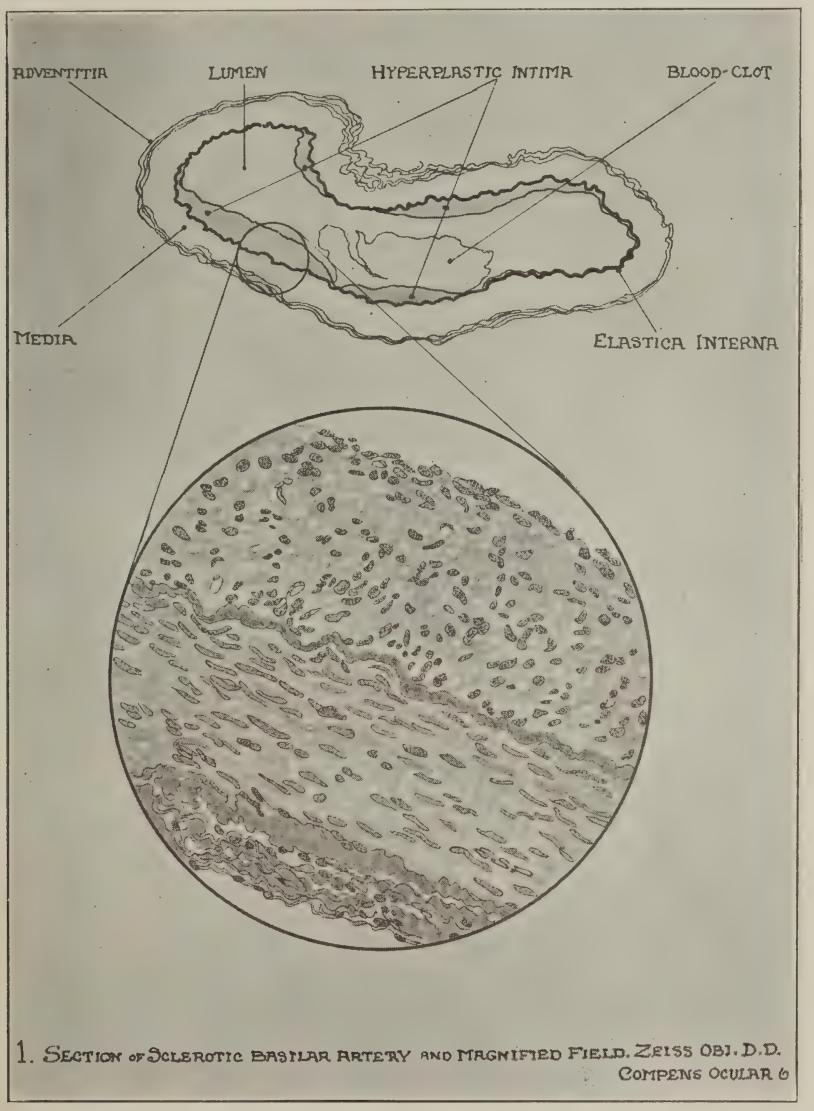
The pineal gland was somewhat flattened and measured 7 mm. in width and 5 mm. anteroposteriorly.

Histopathology of Brain.—A section of the basilar artery at the point of thickening showed a uniform layer of adventitia made up of normal connective-tissue fibers without hyaline change or increased cellularity. The media was somewhat irregular in thickness and its nuclei were rather pale. The elastica presented the usual wavy character but it was slightly thinned and stretched in appearance and showed some fibrous alterations and splitting of its layers. The intima was irregularly thickened with a material that stained a brownish yellow in the Van Gieson preparations. This substance appeared somewhat glistening and refractive. Upon closer inspection it resembled a coagulum with small rounded and spindle shaped holes, the latter resembling clefts of cholesterin crystals. In its greater accumulations it was less cellular; in others, where its growth was younger it was very proliferative in character. This patchy intimal thickening partly occluded the vessel-lumen and its patchiness subtended the irregular arcs making up the circle of the lumen. (See Fig. 1.) The Herxheimer fat stains showed heavy deposits of lipoids in this substance. The fatty material did not extend into the media.

Sections of the principal regions of the cortex and especially those which showed superficial softening in the gross were stained by the Van Gieson method for purposes of orentation and in toluidin blue for cell studies. In all of these the pia was thickened and cellular and its fibers were closely approximated. Especially over the sulci was the increase very marked, but here the fibers were spread widely apart in collections of broad fasciculi. Shorter branching fibers in a tangled mass were found in one place with an accumulation of fluid coagulum giving it an edematous appearance. The veins were congested and their walls thickened. The arteries showed an increase in the thickness of all their layers. One or two were particularly striking. Figure 2 shows one of these which had formed a sulcus for itself causing the overlying cortex to fold over its upper surface. In a very accentuated way the vessels entering the cortex from the pia stood out as bold, erect and thickened strokes perpendicular to the cortical surface. In short all the vessels showed in longitudinal- and cross-section a very marked sclerosis. The Weigert's elastic preparations brought out clearly the thickened elastic layer.

In foci the softening process had altered the architectonic in a very uniform way. Its depth extended approximately from one to two milli-

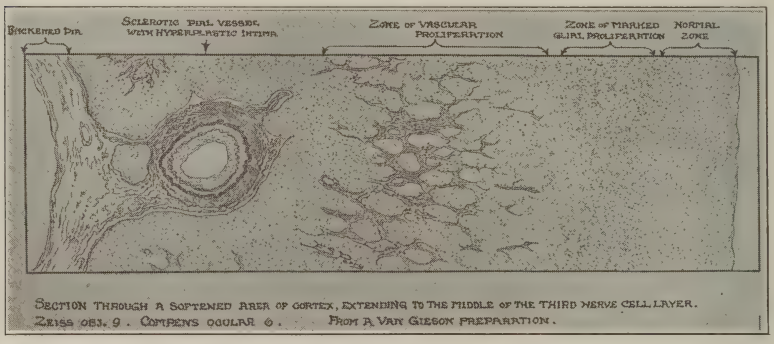
meters inwardly from the surface. This obtained where it often surrounded a cortical fissure, so that the process in making a perfect lamination was so loosened in appearance as to be possible of delamination



1. SECTION OF SCLEROTIC BASILAR ARTERY AND MAGNIFIED FIELD. ZEISS OBJ. D.D. COMPENS OCULAR 6

leaving the more normal remaining cortex exposed at about the beginning of the third layer of nerve cells. The location of the strip of softening was so definite and limited that the molecular layer was easily torn off with the pia mater in the process of sectioning.

This stratum had rather a definite architecture. Its nervous parenchyma was broken up into small islands of varying shapes and sizes and these were sometimes spread apart in an artefactive way by mechanical agents. Between them were strands of proliferating vessels with vascular buds and dense collections of angioblasts and fibroblasts very rich in chromatin. Many new vessels, perfectly formed, ramified the parenchyma in a delicate vine or root-like manner. (Fig. 2.) The center areas of the islets were relatively acellular but their borders near the new vessels showed enormous numbers of glia cells in large swollen progressive forms, with many fat-containing granule cells and glial phagocytes. The Mann preparations brought out very strikingly the ameboid glia with their abundant cytoplasm and the fibrous glia with their long sweeping processes. There were many collections of glial moss with beautiful mitoses. All stages of early and late proliferative



SECTION THROUGH A SOFTENED AREA OF CORTEX, EXTENDING TO THE MIDDLE OF THE THIRD NERVE CELL LAYER.
ZEISS OBJ. 9. COMPENS OCULAR 6. FROM A VAN GIESON PREPARATION.

changes could be followed. Where the reparative process was older there was less proliferation of all elements and a marked presence of fibrous connective tissue surrounded by glial scars containing numerous closely aggregated fibrous neuroglia.

Histological Diagnosis.—Pia mater: Marked fibroid hyperplasia with edema, chronic passive congestion and vascular sclerosis. Cortex: Arteriosclerosis with focal encephalomalacia in varying stages of anisomorphic sclerosis. Status spongiosus with marked reparative glial, vascular and fibrous tissue proliferation.

The cerebellum and spinal cord showed no striking alterations. Their pia mater showed the same fibrosis. Basilar artery—sclerosis with marked hyperplasia of the intima. The pituitary contained a predominance of eosinophilic cells. The accumulation of round cells in its stalk mentioned in Hoag's article proved to be bone-marrow cells. The pineal gland was negative.

The Literature.—In Hoag's presentation of the literature attention has largely been given to the clinical aspects of sexual virilism and its relation to hypernephromata. In it there is a review of Krabbe's (2) hypothesis of the origin of the suprarenal tumor and its relation to the somatic factor of virilism.

In all of the case reports the autopsy examinations are notable for their incompleteness. Particularly is this true of the brain reports. This is perhaps largely due to the fact that examination of the head is oftener difficult to obtain.

It remains for the practical theorist to arrange his material. Falta (3) cites Wiesel's report of a tumor of the sympathetic in a two-year-old child with arteriosclerosis "resembling histologically experimental atherosclerosis"; and also Herde's cases, one a paraganglionic chromaffin tumor with arteriosclerosis and the other a similar tumor with a genuine Schrumpfniere. Thus it was thought important to add our case to this group and to discuss the clinical and experimental evidence regarding the possible etiologic factors involved in the production of arteriosclerosis.

Discussion

Since from the pathological standpoint the striking feature of these cases is the coincidence of the tumor of chromaffin tissue with arteriosclerosis nothing further remains than to correlate these factors in a theoretical way. In a discussion involving so delicate a problem one is certainly cast into speculation. The pathology of the case at hand belongs to the field of those developmental disturbances whose origin is to be sought in that broad expanse of heredo-congenital causes, that is, in an intrinsic failure of the germplasm or, in the action of some blastophthoric agent at an early time in embryonic or fetal life. The tumor itself, if it is not also true of all neoplasms, is of a teratoid nature. Yet one wonders even in the face of evidence if such terms as blastophthoria do not blind the pathologist to any insight into actual play of forces by the use of such catch-words neologized from "inheritance," "disposition," and "degeneration."

Since in our case we are concerned with the adrenal gland and particularly with its cortex, for even the atypical tumor-cells showed lipoids, it is evident that we are dealing with a double factor of etiology. Falta's cases seem to indicate a relation between chromaffin-increase and vascular sclerosis. Our case would seem, therefore, to demand a like disturbance of the chromaffin factor. This is not difficult to assume, though it postulates a metamorphosis of chromaffin cells beyond microscopic identification. The double nature of the adrenal gland with its separate anlagen is important from both the standpoints of anatomic relations and pathologic relations as to normal and abnormal functioning. Thus there is some experimental evidence of a hormone activity of the cortex upon the secretion of epinephrin. The vascular hypertension in this case indicates a like relationship perhaps through increased cortical stimulation or through increase in the chromaffin cells of the medulla in the tumor (4). Atheroma may be experimentally produced by long continued injec-

tion of epinephrin. That this secretion in the amounts in which it is liberated in the blood even in the greatest concentration, recorded experimentally, can have an effect upon the production of atheroma seems doubtful. The relations of an assumed hyperfunction of the adrenals to interstitial nephritis and high blood-pressure has not been satisfactorily demonstrated. There is evidence that the adrenal cortex has a detoxicating function. As stated above, nature's own experiments in producing abnormalities are perhaps under even better control than the laboratory experiment. Therefore, the function of the abnormal may be analogous to the function of the normal. (Herde's Schrumpfniere case.)

If we assume that the cortical softening in our case is a direct sequel of vascular failure there is a relatively simple sequence of events following the development of a hypernephroma. On the other hand bodily processes are so closely coördinated that what often seems chronological may be more synchronous than we know. In a case of this kind it is perhaps not out of order to look for more separate developmental disturbances. If we assume a disturbance of brain-cortical development as a result of a more primary blastophthoria which at the same time gives rise to the tumor-formation, we have then a tendency on the part of the organism to restitute to normal. Certain intimate relationships seem to exist between brain and adrenal. Thus it has been noted that in the normal embryo the adrenal cortex is greatly enlarged, but in anencephalous monsters this tissue or the characteristic boundary line between its cortex and medulla is absent, that is, there is a cortical hypoplasia or aplasia. Schäfer has suggested that a special lipoid formed in the adrenal cortex may be used in the development of the myelin for medullated nerve fibers. Caskey and Spencer (5) have recently shown that epinephrin exerts a specific effect in the brain by a dynamic action upon its cells causing an increased metabolism. In fact it is an important theory that this portion of the gland is a factor in the development of the highly organized nervous system of man, particularly the brain.

Whichever view is taken as to which is the more primary etiology the situation is not made clearer, but it does nevertheless emphasize the close correlations. If the general functional alterations persist, a consequent change in structure must result. In both ways this was nonaltruistic to the organism. If separately related between adrenal cortex and brain, and between adrenal medulla and cerebral vessels, the processes must have produced with increasing demand of nutrition through higher differentiation, more interdependence between interstitium and parenchyma; and then the failure of the

nutritive element perhaps finally caused an ascendency of degenerative nervous tissue changes and a stimulation of reparative processes. The presence of progressive neuroglia in the entire brain indicates isomorphic sclerosis besides the local reparative or anismorphic sclerosis. In this connection is Hyman's (6) report of a case of hypernephroma associated with tuberose sclerosis and Bourneville's observations cited by Falta (7), that in idiots with tuberose sclerosis there exist adenomata of the adrenals. Lastly in our search for correlations mention must be made of Alzheimer's disease. Its relation to hypothyroid states was pointed out by Lafora (8). The arteriosclerotic features of this disease demand further and more complete autopsy findings in correlation with the soma. If the severe morbidity of the processes in this case had not culminated so quickly might she not have lived long enough to be a case of Alzheimer's disease?

These are largely theories and only questions to be asked, but there is in tumors of the adrenal cortex a premature development of the entire organism, a sort of transient prematurity associated with childish dimensions and an early development of the sexual organs showing a relation between genetic constitution and metabolic rate. This, the theoretically dual nature of the case reveals through the abnormal functioning of the two portions of the adrenal resulting in a sexual precocity over a precocious senility. It does not seem contrary to scientific methods to infer a relationship between such striking abnormalities when by their grossly perverse nature they seem to present to our perceptions, in such a magnified and specific way, most important mechanisms of growth. Still one must not be led by this seeming patency of affairs into the "uncharted seas of endocrinology." To assume that the adrenal gland plays the definite major rôle in the production of such changes and thus lightens our ignorance concerning complex biological mechanisms is to really believe that these cases are the missing links in the evolution of a disease that manifests itself in many ways.

BIBLIOGRAPHY

1. Hoag, Lynne. Malignant Hypernephroma in Children. American Journal of Diseases of Children, June, 1923, Vol. 25, pp. 441–454.
2. Krabbe, K. H. New York Med. Jr., 114:4 (July 6), 1921.
3. Falta, W. Endocrine Diseases, 3rd Ed., 1923, pp. 364, translated by Meyers
4. Oppenheim and Fishberg. Archives Int. Med., Nov. 15, 1924, 34:631.
5. Caskey and Spencer. Jour. Physiol., LXXI, No. 3, Feb., 1925.
6. Hyman, A. Jour. Urol., 8:37, Oct., 1922.
7. Falta. Loc. cit., p. 367.
8. Lafora. Trabajos Cajal, Vol. XI, 1913, p. 55.

Society Proceedings

NEW YORK NEUROLOGICAL SOCIETY

The Four Hundred and Thirtieth Regular Meeting, November 9, 1926, Combined with the Academy of Medicine, Section of Neurology and Psychiatry. Dr. I. Abrahamson and Dr. Thomas K. Davis, Presided.

A CASE OF MULTIPLE DURAL NEOPLASMS

Dr. E. D. Friedman

Helen W., a German housewife of 44, was admitted to Mt. Sinai Hospital on September 4, 1926. She had been a sufferer from epilepsy since the age of 14. The attacks were at first left sided and later became generalized. They ceased five months ago. There have been no menses since February, 1926.

Her present illness began about one year ago with headache. This was chiefly occipital, and was accompanied by a drawing sensation in the neck. The headaches became progressively worse and at times were associated with vomiting. She noted recently that her vision became poor.

On the morning of her admission to the hospital, she complained of diplopia, dizzy spells and occasional twitchings of the right upper extremity. The family had observed that her memory was failing and that she had become flighty. In walking, she would turn her head to the right. Occasionally she suffered from nocturnal enuresis.

The physical examination revealed slight inequality of the pupils with a little irregularity of the left; a low grade papilloedema; a slight left facial weakness and some paresis of the right 6th. Hearing was normal and the vestibular tests gave normal responses. There was slight weakness of the left arm and leg, and mild hyperreflexia on the left. Abdominals were not elicited but there was no Babinski sign. There were no frank cerebellar signs in the limbs. In walking, the patient tilted her head backward with the chin directed to the right and the occiput to the left. There was some asynergia of gait and station and a tendency to veer to the right. Her visual fields were grossly normal, and there were no disturbances in sensation. She was facetious and jovial. The examination was punctuated by humorous comments on the part of the patient, and she apparently had no insight into the gravity of her illness.

The general medical status revealed no abnormalities. Blood pressure was a bit low—100/65. The urine was negative. The spinal fluid showed only a moderate increase in pressure. The signs pointed both to the right frontal lobe and to the posterior fossa.

Ventriculography was attempted, but the patient soon afterwards succumbed as a result of paralysis of respiration.

The post-mortem examination revealed numerous smooth, white, hard tumors on the inner surface of the dura. Most of them lay near the midline. They were more numerous on the right side. More than 25 such growths were counted. There were in addition neoplasms similar in character on the inferior surface of the right tentorium, in the region of the right pontofacial angle, and on the posterior margin of the foramen magnum. All of these apparently took origin from the inner surface of the dura, but did not infiltrate the brain. The surface of the brain presented the evidences of increased intracranial pressure. In the right frontal region, near the midline and extending on to the mesial surface of the hemisphere, there was a large area which was soft, friable, and discolored,—apparently degenerative in character, and contained in its depth free blood. The right cerebral hemisphere was swollen about this region and produced a concavity on the mesial surface of the left frontal lobe due to pressure. This mass was not adherent to the overlying meninges. The floor of the 3rd ventricle was thinned out and bulging. There was evidence of a pressure cone of the base of the cerebellum. There was an area of erosion on the inner table of the skull in the right frontal region.

The post-mortem diagnosis was multiple endotheliomata of the dura, with a large area of softening and degeneration in the right frontal lobe.

Discussion. Dr. J. H. Globus said: The specimen shown by Dr. Friedman is indeed an exceedingly uncommon one, and, as any uncommon specimen, it is of interest mainly to the pathologist. Clinically, however, a specimen of this sort is not an especially instructive one, because the signs and symptoms arising from such a multiplicity of tumors do not give the neurologist any opportunity to identify or localize the lesion, for multiple tumors of this sort are so easily confused with inflammatory lesions of the brain. Pathologically, however, such exceedingly unique specimens are highly useful. Very likely specimens of this type may throw light on the origin of endotheliomata, and put to test the explanation, suggested by Cushing, for the origin of these tumors. He believes, as you know, that endotheliomata are misplaced embryonal rests of the arachnoid. They have been displaced and carried away into the dura, there giving rise to tumor formation. For this reason he names such neoplasms meningeomata.

In this case, among the many dural nodules, a similar tumor was found extending into the frontal lobe. The specimen leads one to believe that the explanation of Cushing is a correct one, and this is the only service which was rendered by this case.

Dr. J. Ramsay Hunt said: Some years ago in my study of tumors of the acoustic nerve and neurofibromatosis I encountered the association of multiple fibroid tumors of the dura mater with general neurofibromatosis. In the literature a similar association has been recorded although the occurrence is rare.

The pathological appearance of the dura was exactly as in Dr. Friedman's case, and was limited to the dural covering of the brain, and did not extend into the spinal canal. At the time some consideration was given to the possible origin of these tumors in the nerve supply of the dura mater; in other words, that the condition was a dural neurofibromatosis, and in a few of the tumors medullated nerve fibers were demonstrated, and it might be well to consider this possibility in future pathological investigations.

THE CHANGING MANIFESTATIONS OF THE NEUROSES

Dr. I. S. Wechsler

The observations which I have to make are not altogether novel, and the explanations are perhaps not quite correct, but I venture both in the hope of criticism and discussion.

When one looks over papers and textbooks, even as recent as the 1924 revised edition of Oppenheim, one finds considerable attention devoted to the manifestations of the neuroses which we never see—hysterical hemiplegias, other paralyses, aphonias, astasia-abasia, and all sorts of conversion signs. But all those cases were abundantly seen by the older observers. It would be comforting to think that we are the better diagnosticians, but it is not quite true. Men of the type of Charcot, Moebius, Weir Mitchel, Binswanger, etc., were very accurate observers, and they undoubtedly saw all the manifestations of the neuroses which we do not see to-day. And I have proof that they were right. If you take the first quarter of this century in which few of the hysterical paralyses have been observed, you find one island wherein tens of thousands of patients showed just those symptoms. I refer to the war. During that period, whether it was the phlegmatic Englishman, the stolid German, the volatile Frenchman, the somber Russian, or the composite American, they all showed the hysterical palsies, stammering, blindness, and so forth. It is evident therefore that those hysterical manifestations can and do occur. It is we who do not see them in civil practice.

My observations are based on rather extensive experience at the Vanderbilt Clinic, which has a yearly admission of about 2,000 patients, on work at the Mount Sinai Hospital and Dispensary, at the Montefiore Home and the Central Neurological, the last two of which have chronic cases. Among the thousands of cases seen personally I recall but one case of hysterical convulsions such as described by Charcot, one or two hemiplegias and monoplegias, and a few aphonias. The question is, why don't we see them? Why do not other American neurologists see them? What has happened in so short a time, or has anything happened at all? It seems to me there must be some explanation.

If you look on a neurosis as an attempt at adjustment, and if you accept the opinion that a neurosis is the result of a conflict, then you must concede that both the older and more recent manifestations of the neuroses are all attempts at adjustment. What we do see are

anxiety neuroses, phobias, so-called neurasthenias, compulsion neuroses, maladjustment cases, borderline types. The former may be designated as low somatic types of adjustment, and the latter higher psychological types. Both are the results of conflicts and attempts at adjustments which the patients must make in order to hurdle life's difficulties.

I think it is conceded by many that religion (by that I do not mean the philosophical or speculative aspects, but the ceremonial and ritualistic), represents in a measure a neurosis which is accepted and condoned by society. When a person makes the sign of the cross, puts on phylacteries or salaams to the east he does exactly what the compulsive neurotic does when he goes through his ritual, fixing his pillow, counting numbers, or doing certain things; with this difference, that the social compulsive act is not in conflict with the social group. In religious ritual the neurotic has his outlet for the neurosis: he need not get into the conflict with society by begetting a neurosis. The Jew putting on phylacteries in the synagogue is considered perfectly sane; let him do it in the street and he would probably be apprehended as queer. Religious ritual, then, offers an outlet for individual neuroses.

If you take a Catholic girl who is disappointed in love, takes the veil and enters a convent, thus marrying her ideal, she escapes an individual neurosis because she loses herself in a social neurosis. The same procedure suddenly followed by a Mohammedan, Jewish, or Protestant girl would arouse grave suspicions as to her sanity. Throughout the ages waves of religious movements (tarantula dances, flagellations, crusades) expressed themselves in hysterical manifestations. To this day we have in this country epidemic or endemic revivalist meetings, in which whole communities find hysterical outlet. It may be observed that the very loud hysterical shrieks which fundamentalist ritualistic fervor employs against modernism are only the signs of helplessness in a losing fight, of infantile neurotic reactions in the face of advancing reality. They may insist on erasing evolution from text-books; their fight is but the last gasp before the avalanche of knowledge that is coming on to overwhelm reaction.

You may ask, if my observation is correct, can it be that one generation has brought about such a change in the manifestations of the neuroses? Even if we only reckon the period of recorded history, almost a hundred generations, what does one generation amount to? But it is quite possible that the intense and very rapid diffusion of knowledge in recent years, the familiarization with scientific facts, the spread of the knowledge of evolution, the weakening of religious ritual, have tended to mature the sense of reality and gradually prevented the widespread infantile, low level types of reaction to conflicts arising from the struggle for adaptation. A child will express his displeasure in the face of conflict by kicking or screaming, but the adult can no longer adopt the same method. This may be one explanation; but I should like to offer another, perhaps even more theoretical and philosophical: A neurosis is the penalty one may pay for growing up, or for the unsuccessful attempt to grow up.

Growing to adult state is bound up with a great many difficulties, with the need of hurdling obstacles in the path of life. Those who cannot hurdle those difficulties will react with neuroses at one or another time. We see that at puberty, in adolescence, in social and love life. The neurosis represents the attempt at adjustment, the failure in the conflict and the flight from reality.

The question in my mind is, is it possible that groups, like individuals, go through the same stages of development? May we say that phylogenesis repeats ontogenesis, the reverse of what happens in general organic life? Before I develop this point a little further, I should like to cite a few statistics. I have taken the records of the patients admitted to the Vanderbilt Clinic for the past few years. Fifty-five and a half per cent of the total number of admissions to the neurological department represent neuroses. The colored population of the clinic showed only 29 per cent of neuroses. Then I compared the incidence among the American negroes and the British West Indians. You will all agree with me that the British West Indian negro is a better type than the American negro. He is more intelligent, better educated, and socially superior to his American brother. The American negro had 27.5 per cent neuroses, and the British West Indian negro 35.5 per cent, about 8 per cent higher than the American. The negro with better opportunities and perhaps a little more freedom has developed neuroses to a greater extent.

Again merely stating the question, Does the group of necessity develop neuroses in its march upwards? I do not know either the incidence or types of neuroses among the Japanese and Chinese; nor do I know whether neuroses exist among primitive peoples. A priori I should say that there can be no neuroses among primitive people, because their whole social existence is a neurosis, an infantile reaction to life. The group spirit and force of taboo is so great that there is no possibility of revolt. One cannot transgress social usage or taboo in primitive society without incurring the punishment of death. Only civilized man can afford the luxury of a neurosis. I do not know whether my speculations apply to all groups. I am merely wondering if we can speak of a neurosis as a manifestation of the group in its march up the scale of civilization as of the individual in his growth up the tree of life.

Occasionally a neurosis is the revolt against the social hypocrisy which forces people into ways of living to which they cannot possibly get used. Sometime I shall write an essay entitled, In Praise of Hypocrisy, with apologies to Erasmus' In Praise of Folly. It seems to me that the very violence with which the social group reacts to the hypocrite betokens a defense mechanism on the part of all of us.

It is quite possible that diffusion of psychoanalytic knowledge, the realization of the mental mechanisms constantly at play and the influence of the psychology of motivity on human thought and action will affect our methods of adjustment. Thus far it is premature to say that it has affected behavior. Besides the subject of psychoanalysis is too vast for a discussion in this connection; here I would merely hint at it.

In summing up, I wish to repeat the observation that we do not see the types of neuroses that have been classically described in years gone by; that the older types are low-level or somatic reactions; and that what we see to-day are higher, psychological manifestations. Only the methods of adjustment have changed, not the reactions of the individuals or the need for neuroses. If anything, the conflicts have become more intense, the needs for neuroses greater and the social casualties more numerous.

Discussion: Dr. Louis Casamajor said: Dr. Wechsler has many interesting points in regard to the neuroses as we see them to-day. Those who have been working with neurological material for a number of years have noticed a change in the neuroses, and we all have felt for a number of years that the old hysteria of Charcot, with the conversion paralyses and the anesthesias are things which are disappearing from our medical life. We have not altogether understood what this meant, and we do not quite understand it to-day, because it is not altogether true. Certainly in the days before the war we did not see much of the anesthesias, the paralyses, and the conversions, those things which Dr. Wechsler calls the lower levels of the neuroses. During the years of the war, in those very primitive conditions in which man found himself, many of these things came back, and the old type of good old-fashioned neurosis seems to have been reëstablished in our symptomatology. After the war, again, we saw a tendency for the neuroses to return to the higher levels of expression, but new elements began to come in, and that element which tended to bring the neuroses back to the lower levels seemed to be principally the element of compensation, and the good old-fashioned neuroses which we see to-day seem to be almost completely restricted to those neuroses which arise as the result of the Workmen's Compensation and Veteran's Bureau laws. I will invite anyone who wants to see the old-fashioned neuroses of twenty years ago to go to the Veterans Hospital, where you will see all of them, and it would appear that the element of compensation has done something to bring out that type of neurotic expression. What Dr. Wechsler has said about the education, culture and civilization of the individual has a great deal to do with the type of neurotic expression. Probably the lowest type of neurotic expression is a conversion. That is probably the easiest one to manifest, and it is certainly the most common. If one would attempt to make a series of neurotic symptoms, I think paralysis would come first as the lowest. Then come the anesthesias and so on up through the anxieties to what may be the higher levels for the neuroses, where we can place the phobias and compulsions. However, I do not know that things are changing very much. In reality it takes a very little to bring the neurotic down to a lower level and while we may have much of what we consider the higher type of neurosis, we have a lot of the lower ones.

Practically all of my life I have been connected with the Vanderbilt Clinic, where twenty years ago we saw very few neuroses among the negroes. Most of the negroes lived then in small groups and a great number of them lived in the "San Juan Hill" district, in very

primitive conditions. Following the war the percentage of neurotic negroes increased, and this increase was mostly among the British West Indian negroes. I feel that this change is due principally to the changes that have taken place in the negroes' living conditions when he moved from small, simple communities, such as that of the "San Juan Hill," to that larger negro city in Harlem, with its customs, its civilization, and their reaching out for personal and racial expression of some sort, while being surrounded by a white civilization in which they are in competition. This has brought upon these still primitive people cultural standards three or four jumps ahead of the previous generations. They may try to adjust these conditions my means of neurotic difficulty in just about the same way as the whites do.

Dr. Foster Kennedy said: Dr. Wechsler's thoughtful and provocative discussion is hard to criticize and very hard to discuss. It is nearly seventeen years since I came from a large European clinical material to an equally large American clinical material. I was then immediately surprised to note the absence here of many examples of constructive conversion hysteria with which I had been entirely familiar in London. We were never, in Queen Square, without two to six cases of hysterical hemiplegia, one or two cases of hysterical blindness, and at least hysterical aphonia was to be seen in the house. I think in the Neurological Institute in New York and on our service at Bellevue such cases are rare; they were just as rare seventeen years ago. I do not think in America any particular change is taking place in the neuroses, at least in the time I have been seeing American clinical material. There is a difference in the reactions here to the reactions which occur in Europe, and which occur I think equally in Germany, France, England, and Italy. Dr. Wechsler tried to give a reason for this. His reasons are fairly plausible. I do not know that they are sufficiently sound. He assumed that the conversion hysteria is a more primitive and more somatic reaction than a generalized phobia. That jumps the eye, but it may not be true. I remember in France differentiating in my mind the soldier with a generalized neurosis, a generalized defense reflex condition in an organism given over to only one emotion, of fear; the officer, who with too much conscience and striving hard to do his best was neurotic about his responsibility toward his men, and broke down thereby. Usually it was the Tommy, I think, rather than the officer, who, having been hit with a bit of flying earth, sustained an hysterical paralysis of the arm, which he thought for a moment has been blown off. Perhaps a medical officer suggested then that he had a brachial palsy, and the idea put into the man's mind gave him a paralyzed arm. I used to call this "localized suggestion." One was a breakdown of the man's whole emotional nature. The other was a conservation measure of his emotional nature. The man who got hysterical paraplegia was never unhappy emotionally. He was in the same position as the wounded man, and the wounded man was not neurotic. The man who had a sufficiently severe wound to solve the problem of the war for him was not neurotic. The man who

succeeded by suggestion given to him from without, either by a slight wound or a bit of flying earth hitting him, or the badly directed verbal suggestion of a medical officer, in getting a paralysis of the arm was in precisely the same state as the wounded man, and was not unhappy; so that conversion hysteria is a method, inadequate if you will, of getting over one of those hurdles which Dr. Wechsler spoke of as confronting every person who reaches adult life. We may find that the hurdle is too big; we balk at it; we cannot get over the five-bar gate. One way of explaining to the world our inability to get over that hurdle is to say that we are paralyzed, and that by reason of that paralysis it is not necessary to tackle the difficulty, and we are free of our obligation to get over that hurdle. If we do not get that suggestion, if we cannot convince ourselves that we are paralyzed, or cannot accept the suggestion of another that we are paralyzed, or aphonic, or in some way get out of the difficulty, then we may develop a phobia. I remember a lady who had a phobia that she could not get into a ferry, or into a motor car; she was in an automobile accident and had an injury to her leg. On that slender substructure she erected a complete hysterical paraplegia. While she had the hysterical paraplegia, she was perfectly happy emotionally. Her fears were relieved. When she was cured of her paraplegia, her phobias returned. I think that conversion hysteria is a fairly adequate attempt on the part of a weak nervous system to cope with the difficulties of life, and the American population does not accept a suggestion as readily as does the European. Anyway, he did not when I saw him seventeen years ago, any more than he does to-day. One statement of Dr. Wechsler's interested me, when he said the more intelligent the person is, the more neurotic. I should like to ask him what he meant by the more neurotic. Does he mean more fearful, more tremulous, more given over to ritualistic observances, or does he mean that conversion hysteria is more common?

Dr. Casamajor's statement that compensation can produce conversion hysteria of the type that we are all familiar with in Europe is another example here that by properly directed suggestion conversion hysteria will be produced, and suggestion will produce the necessary paralysis, the necessary blindness. After all, we were all at times scared stiff in the war, and if we could have gotten rid of the war in some way or other compatible with our dignity as a human being, we would have been very glad to have done it!

The person who getting hurt in a railroad accident sees an opportunity to sue a rich corporation against which he feels a grievance, has a basis for a conversion hysteria which the ordinary person does not have.

Dr. J. Ramsay Hunt said: A few years ago Dr. Dana and others in this country wrote on the subject of "The Passing of Neurasthenia," a disease which was described by Beard, and has sometimes been called the American neurosis. What these writers meant was, *not* that neurasthenia had died, but simply that we had come to look at neurasthenia in another way. We had acquired a much deeper insight into this condition, its causes and relation to other disorders. And while neurasthenia lost some of its importance

as a disease, it gained immensely in our better understanding of it as a syndrome. This, it seems to me, has taken place with the psychoneuroses in general, and we must bear in mind our own change in viewpoint and our increased knowledge of these disorders, especially of mental mechanisms and the important psychic aspects of this great field.

In this country the conversion hysteria of the gross somatic type has always been comparatively rare, as compared with France, and there is little doubt that this group was overemphasized by the French school in Charcot's day. We do not now attach so much importance to these somatic forms as we are interested more particularly in the deeper psychic mechanisms of these cases. This removes a potent suggestive factor which was undoubtedly active in the Charcot school.

Dr. Wechsler's paper is interesting in suggesting that the psychoneuroses which are, as it were, a by-product of our civilization, change with the evolution of society. And while this may be true, I think the lapse of time which is implied as having caused a change is far too short to have had any material effect upon this group of disorders. I would ascribe the apparent change rather to the progress which medicine has made in the last decades and the rapidly shifting point of view in our conception of the psychoneuroses. It is here that I would look for the apparent change in the natural history of the neuroses rather than in the psychic and somatic manifestations themselves.

Dr. Wechsler (closing the discussion) said: The war neuroses differ in one fundamental respect from the peace neuroses. A war neurosis represents essentially an ego neurosis. The mechanism is the same as in the peace neuroses, but the neurosis is not the same type. In war you found an individual who had a sense of patriotism, loyalty, honor, esprit de corps, etc. He could not possibly escape or revolt against them. The ego or self-preservation instincts were involved; therefore, it was a definite ego neurosis, and not a psychosexual basis as in the peace neuroses. The latter are rooted in the individual all the way back to his childhood. We may accept this even if we would not accept the Freudian explanation in toto. If a man past forty who has never been neurotic before presents a syndrome of neurasthenia or other neurosis we generally look for brain tumor, general paresis or cerebral arteriosclerosis. Very few men get up neuroses suddenly, though all of us are capable of reacting with a neurosis if the conflict is sufficiently intense. In the peace neuroses, then, you can find traces all the way back to childhood. Of course it is possible that the men who developed neuroses in the war would have developed them in peace, but I think it is a different type of neurosis. Most observers during the war recorded the fact that officers were subject to different types of neurosis than the ordinary soldiers. It was the officers who developed the phobias and the anxieties or the higher psychological reactions. The plain soldier reacted with a conversion symptom or a low somatic neurosis.

The question of compensation, too, I think could be divided into two parts. What Dr. Casamajor says is perfectly true, but I think

the following may serve as an explanation. One may find in an industrial accident an unconscious excuse for getting out of a difficulty with which one was confronted in life. A man may have a horrible home life, the accident merely serving as an excellent excuse for getting out of the situation. Of course, if he does this consciously he comes dangerously near the malingering class. The other type, the true traumatic neurosis, may possibly be considered as an actual or ego neurosis.

The question whether the more intelligent the more neurotic, is hard to answer. I believe that horses do not get up neuroses. One has to have a certain amount of brains to have a neurosis, a definite layer of consciousness, a certain depth to the unconscious and a fair degree of intelligence. It is true we see hysterias in mental defectives, but I do not think that an anencephalic individual can get up a neurosis. He does not get up anything else either, for that matter. To infer that the American is more intelligent than other people would be flattering to us, but we should probably have the League of Nations in arms against us for saying it. But I do think that a certain degree of intelligence is necessary for a neurosis. It is curious that compulsion neuroses, or the highest psychological types, are most common among highly intelligent people.

Answering Dr. Hunt that we as diagnosticians have changed and not the neuroses, it probably is so with regard to neurasthenia. The reason for that is that the concept of neurasthenia has changed. Formerly everything that we did not know how to label was included under it. Psychasthenia was taken out of it and made a separate entity, and so was anxiety neurosis, anxiety hysteria, etc. Neurasthenia has disappeared, not because our observations are faulty, but because our methods have changed. As I said, the method of adjustment has changed, not the need for neuroses. Dr. Kennedy's remark that the American has a different method of reacting may be true, but why does he have that? To say that we are different psychologically is obviously not quite true. What is different is our environmental situation. Unfortunately I have no experience with other peoples, and so I can hardly make comparisons. It would be interesting, however, if some one could take up anthropologic studies with regard to the neuroses and also investigate the influence of religion on the neurotic behavior of various groups and in various countries.

ENCEPHALITIC AMYOTROPHIES

August Wimmer

PROFESSOR OF PSYCHIATRY AND NEUROLOGY, UNIVERSITY OF COPENHAGEN

(By Invitation)

Discussion: Dr. Sachs said: It may interest Professor Wimmer himself to know that in this country during the epidemics of encephalitis, we have observed a few of the cases which he would group as encephalitic amyotrophies; but we are particularly im-

pressed by another group of cases which from a pathological point of view can be similarly interpreted, and those are the cases in which were all the symptoms of encephalitis, and in addition, the clinical picture of complete acute transverse myelitis; instead of the region of the anterior horns having been particularly affected, as in these cases of Dr. Wimmer's, there was no doubt a central myelitis. The interesting question is why the process should be selective, even to this degree, and the idea that the encephalitic virus itself was present in the tissue would make it a little easier to interpret so that in some of these cases the virus was located in the anterior horns, and in the case observed here, the virus must have assembled around the central canal and the parts contiguous to it. The especially interesting and striking feature about the cases which Professor Wimmer presented was the very complete resemblance of his cases to the pathological pictures we have been accustomed to associate with amyotrophic lateral sclerosis. I would like Dr. Wimmer to state one thing, whether in the second case which he reported with the very complete and excellent microscopic pictures, it was a case of long standing, or whether it was one that had developed rather rapidly, because if the case was of short duration the complete degeneration in the pyramidal tracts is very striking; but if a case of that sort had lasted for more than a couple of years, I could more easily understand it. If the case had been one of much shorter duration, I think the degeneration in the lateral columns is surprisingly complete. The other point of especial interest to me is to ask if he thinks that amyotrophic lateral sclerosis as a rule is of infectious origin, or not. In those cases which I have seen, I have not in a single instance been able clinically to establish, or convince myself, that there has been an infectious origin. We tried for a time to see whether there had been any history of trauma. That also has failed, so that in the whole field of amyotrophic lateral sclerosis, the etiological factor has been very much in doubt. I would not be at all surprised if we were compelled to infer that this was a disease of infectious origin, and the surprise would be no greater for us than for instance the cases of chorea, which we no longer have any doubt in pronouncing of infectious origin; and whereas twenty-five or thirty years ago we spoke of them as functional, now we know them to be organic.

The interesting point about this whole discussion is that it not only shows us the widespread changes that this one virus causes, but it is going to help us to interpret amyotrophic lateral sclerosis, and perhaps other degenerative groups. I want personally to thank Dr. Wimmer for his excellent presentation, and I am certain that all of those present have enjoyed his address.

Dr. J. Ramsay Hunt said: It is a great pleasure to be here this evening, and to greet Professor Wimmer.

My own experience with the amyotrophies, as a complication of encephalitis, is very small. I only recall two cases that I have seen in which there were amyotrophies. One was in the upper extremity, and the other was in the lower extremity, and both were unilateral. In neither of them was there sensory disturbances or a history of

sensory disturbance which would indicate a neuritis. A pressure neuritis could also be excluded and this should always be borne in mind, for in severe types with delirium and unconsciousness, often requiring restraint, the nerves or muscles may suffer injury during the acute period of the disease. In my two cases the atrophic changes were confined to a small area and were not definitely neural in distribution so I concluded they were probably dependent upon small areas of localization within the spinal cord. I have seen nothing like the interesting case that Professor Wimmer has recorded of amyotrophic lateral sclerosis of encephalitic origin. Excepting that he has presented in such detail his microscopic findings, my first feeling would be that the patient was a case of potential or incipient amyotrophic lateral sclerosis, and that the infection had merely precipitated the progress of the disease. In other words, that the encephalitis was a secondary and not a primary factor in the causation of the disease. We all know that amyotrophic lateral sclerosis is a disease which does at times progress with great rapidity. I think we have all seen cases where the disease has been greatly aggravated by an acute illness. I cannot say, however, that I recall any case in which the disease directly resulted from an acute infection, but I do not doubt that such associations are to be found recorded in the literature. For my part, I think in many ways a safe interpretation would be to regard the condition as having been precipitated or aggravated by the virus of encephalitis, rather than to say that this disorder, which we regard as a system disease, is directly caused by the infectious agent of this disease. Professor Wimmer's experience with the amyotrophies of encephalitis is now so large and he has given this subject such intensive study that his opinion must be regarded as authoritative and deserving of very serious consideration. It certainly will stimulate us all to review our ideas of this most interesting subject.

Dr. M. Neustaedter said: Dr. Hunt's suggestion, as I take it, is that there probably was a locus minoris resistentiae which gave way to the infection. In the beginning of the epidemics we thought that the virus had a selective affinity for the brain, particularly the midbrain. Since then we met with all sorts of syndromes referable to lesions of the entire cerebrospinal axis and peripheral nerves. I have seen a case of a central myelitis that was without doubt due to the encephalitic virus, but I have not met with the syndrome of amyotrophic lateral sclerosis due to encephalitis. It is characteristic that lately in New York City the chronic form of the post-encephalitic form has been mostly of the Parkinsonian syndrome. It seems to me that we might postulate that the virus has no particular selective affinity for any part of the cerebrospinal axis, but that it will affect any part with a locus minoris resistentiae, and thus diverse syndromes will become manifested.

Dr. Henry Alsop Riley said: I have listened to Dr. Wimmer with great pleasure this evening, chiefly on account of his interesting presentation, but also because in 1921, I brought together a group of cases of "spinal forms of epidemic encephalitis" for the meeting of the Association for Research in Nervous and Mental Disease which

considered the subject of epidemic encephalitis in December, 1920.

A few features of this study remain quite freshly in my memory and they may be of interest to you. In my cases, the occurrence of actual fascicular twitchings was relatively rare, the abnormal involuntary movements being of a considerably more gross character than those we are accustomed to see in the classical instances of amyotrophic lateral sclerosis and involved a group of fasciculi or even a part of a muscle.

It occurred to me that this difference might be due to the involvement of a connector neurone whereas the finer fascicular twitchings were caused by direct involvement of individual ventral horn cells. As is well known, there are about ten times the number of ventral horn cells as there are pyramidal tract fibers and therefore, to bring the individual ventral horn cells under the influence of the pyramidal tract fibers, it is necessary to interpolate between this fiber and the eventual ending of its influence over the ventral horn cells an intercalated connector neurone which in turn establishes synaptic junction with about ten ventral horn cells. The involvement of this connector neurone may be the explanation of the larger involuntary movements which were seen in the spinal form of epidemic encephalitis, the brunt of the attack falling on these cells rather than on the ventral horn cells themselves.

Another point of interest was the appearance of pain of a radicular type in the dermatomes corresponding to the segmental derivation of the muscles which later showed loss of strength and atrophy as a result of involvement of the ventral horn cells with which they were connected in the ventral gray column. This suggested the possibility of the progress of the disease over the dorsal roots, to the connector neurones and eventually to the ventral horn cells themselves.

I was also interested in what Dr. Sachs said about the appearance of transverse myelitic phenomena. I found a number of cases which represented this type of involvement but at the time I suggested that this type of pathological involvement might be the result of hemorrhage in the grey and white matter rather than from a direct action of the disease process itself. These phenomena seemed to be secondary in character, an incident as it were in the course of the development of the clinical picture.

One of the illustrations used by Dr. Wimmer was very similar to a case which was in the Presbyterian Hospital and came to autopsy. In this patient, the muscular washing was generalized and extremely marked. Pathological examination of this spinal cord showed an appearance as if the entire ventral horn cell population had been wiped out in a more or less devastating process, only an occasional ventral horn cell remaining to be seen in the sections.

Dr. Wimmer (closing the discussion): I thank the gentlemen for their observations on epidemic encephalitis. I do not fully control the English language, but I should like to add a few remarks.

Dr. Sachs found the duration of my principal case rather short. I do not think the duration of these encephalitic amyotrophies is

shorter than the usual average duration of amyotrophic lateral sclerosis. In France it has been given as from three to three and a half years, and cases of a longer extent are supposed to be exceedingly rare, and have very rarely been published. So I think that this fairly short duration of the amyotrophic encephalitis syndrome will go very well with the clinical course of the amyotrophic lateral sclerosis, the so-called Charcot's disease. In my opinion, the short duration of this so-called degenerative disease has always made it rather strange that it should be a degenerative disease of the spinal cord, seeing that in almost every other true primary degenerative lesion of the spinal cord or the nervous system the duration is usually very long. Three and a half years for a chronic amyotrophic condition is rather short, I think. Dr. Sachs is not disinclined to believe in the possible infectious origin for the cases of so-called Charcot's disease. He remarked only that in his personal cases he had never been able to say that a definite infection had preceded the nervous disease. On this point our ideas have changed a little with the experience of the epidemic of encephalitis, for really cases where it is quite impossible to ascertain the initial infectious stage are rather numerous, at least in my observation, and even in those cases we get a most marked clinical picture of the epidemic encephalitis; and then again, you get most marked anatomic findings, so in my opinion the diagnosis of epidemic encephalitis need not be based on the presence or not of an initial, more or less typical classical stage, but on the total clinical picture, so that this circumstance, that in so-called classical amyotrophic lateral sclerosis we cannot ascertain a definite infection would not, to me, exclude the possibility of an infectious origin.

Dr. Hunt suggested that this seeming connection between exogenous infection and amyotrophic lateral sclerosis syndrome may sometimes be only an aggravation of a preceding or preëxisting spinal disease by the infection. That is a possibility, but as regards my cases here, there were no clinical symptoms of a preëxisting lesion of the spinal cord. At least the patient could give me no signs whatever of such a condition. We have to think of this possibility, for we can never exclude possibilities, and yet I think it is more economical to go the other way. I really have touched a little lightly perhaps on the most important question, the possible anatomical and histological predisposition of all these systemic lesions of the spinal cord. Surely there are always some local predispositions for the localization of exogenic pathogenic causes. You will scarcely find any of the existing diseases that has not got, according to Bauer, some local histological predisposition. Maybe some time we will find what that predisposition is; but as yet it is more or less a mere word. Therefore I have not gone very far into it. I shall not deny that such a predisposition may exist, and that it might also in the case of encephalitis make out for the special localization the seemingly systemic localization of the morbid changes.

Current Literature

I. VEGETATIVE NEUROLOGY.

2. ENDOCRINOPATHIES.

Else, J. E., and Irvine, H. S. The Causes of Surgical Failure in Hyperthyroidism. [J. A. M. A., Vol. 83, Oct. 14.]

A review of the literature shows that from 65 to 75 per cent of the patients operated on for exophthalmic goiter make a complete(?) recovery. The majority of the remaining 25 to 35 per cent are benefited; but some show no improvement, and death occurs in from 1 to 4 per cent. In the cardiovascular group of goiters, including the toxic adenomas, adenomatous and compensatory hyperplasia, better results are obtained. During the last two and a half years, approximately 300 cases of goiter of various types have been studied. In this group were several cases in which the patients had been previously operated on without complete relief. These cases were studied in conjunction with unoperated cases of similar types in order to determine, if possible, the causes of the incomplete results or failure. The authors found that deaths or severe reactions following operation are for the most part due to avoidable errors. Incomplete results following operation on patients with hyperthyroidism are due to delayed operation, insufficient operation, or insufficient aftercare. It is urged that patients with hyperthyroidism must be operated on early if permanent lesions are to be prevented. Medical treatment will usually carry a patient over the crisis into the stage of remission, but beyond its use in preparing patients in a precarious condition for operation, it has no place in the treatment of toxic goiter. Hyperthyroidism is a surgical disease. The authors stress the fact that after-treatment is as important as the operation. A surgeon's responsibility does not end until the patient is in the best possible physical condition. A surgeon is not justified in operating in, or treating, a case of hyperthyroidism without frequent determinations of the basal metabolic rate.

Huddleson and Bailey. Thyroid Dysfunction and Neuropsychiatric Disorders. [Am. Arch. of Neur. and Psych., Vol. VII, No. 3. J. A. M. A.]

The material reported on by Huddleston and Bailey consisted of ninety-four consecutive outpatient cases, clinically examined, of war veterans suffering from thyroid dysfunction accompanied by some neuropsychiatric disorder. They conclude: (1) that the incidence of dysthyroidism, increased by the war, is now in the decline but has not yet reached its

prewar level; (2) that the bulk of this increase is made up of toxic non-exophthalmic, vagotonic cases, and cases transitional between this and the sympathicotonic type; (3) that many causes for the increase have been variously operative, none predominating; and (4) that there is a distinct tendency toward improvement in all types of toxic cases caused by the war.

Kessel, Leo, Lieb, C. C., and Hyman, H. T. Study of Exophthalmic Goiter and the Involuntary Nervous System. [Journal A. M. A., Vol. LXXXIII, Oct. 7.]

These authors define exophthalmic goiter as (1) a clinical collection of sympathomimetic symptoms (tachycardia, tremor, exophthalmos, sweating, asthenia, polyrrhea [diarrhea], etc.), associated with (2) metabolic upset (elevated basal metabolism), and usually accompanied by (3) hyperplasia of the thyroid gland. No one of these three components is pathognomonic. Elevations of basal metabolism may occur in other conditions dissociated from goiter or alterations in the involuntary nervous system. Hyperplasia may also occur dissociated from alterations in the involuntary nervous system or elevation of the basal metabolism. Sympathomimetic manifestations may be present with or without hyperplasia of the thyroid gland and with a normal basal metabolism. It is to the last group of symptoms that the authors apply the term "autonomic imbalance." This syndrome differs from exophthalmic goiter only in that the basal metabolism remains normal. Patients with active exophthalmic goiter usually give a history of autonomic imbalance, and those with arrested exophthalmic goiter differ only in presenting a history of crisis. The transition from autonomic imbalance to exophthalmic goiter occurred in a patient under observation. This led the authors to believe that disturbance of the vegetative nervous system plays an important rôle in the causation of exophthalmic goiter. The fact that stimulation of the vegetative nervous system by epinephrin produces an elevation of the basal metabolism and that this increase is independent of the thyroid gland suggested a more complete study of the vegetative nervous system, especially the thoracolumbar parasympathetic division. Since it is claimed that epinephrin acts only on the myoneural junctions of the parasympathetic, the sensitiveness of these patients to the subcutaneous injection of epinephrin localizes the abnormality in the myoneural junctions.

Holst, J. Pathogenesis of Exophthalmic Goiter. [Norsk Mag. f. Laeg., Vol. LXXXIII, No. 7, p. 527. J. A. M. A.]

Holst comments on the way in which a primary exophthalmic goiter may keep up an active growth with progressive emaciation of the rest a certain independent autonomy. It begins with multiple epithelial tumors which merge into each other until the pathologic condition is diffuse. Cancer of the thyroid sometimes induces fulminating exophthalmic goiter symptoms. He adds that acromegaly, which in many respects resembles exophthalmic goiter most closely, is the result of an epithelial tumor in the organ which resembles the thyroid most, namely, the pituitary body.

Major, Ralph H. Acidosis in Hyperthyroidism. [Journal A. M. A., Vol. LXXXIV, Jan. 13.]

Two cases of marked acidosis associated with hyperthyroidism of moderate severity are here reported, the condition appearing in one instance after roentgen-ray treatment of the gland, and, in the other, following a lobectomy performed under nitrous oxid and oxygen anesthesia. Both patients responded promptly to the administration of alkali.

Labbé, M., et al. Differential Diagnosis of Exophthalmic Goiter. [Bulletins de la Société Médicale des Hôpitaux, Vol. XLVI, No. 20, p. 902. J. A. M. A.]

Labbé and his co-workers relate that their experience with eight cases of typical exophthalmic goiter, eleven with the incomplete clinical picture and seven of simple goiter, has confirmed the statements of the Americans in this line. Exophthalmic goiter seems to consist of two superposed sets of symptoms: those from hyperthyroidism, revealed by the exaggeration of the basal metabolism and the test hyperglycemia, and those from sympathicotonia, revealed by the tachycardia, the exophthalmos, hot flashes, vasomotor disturbances, sweats, attacks of diarrhea and pigmentation, all of which can be realized in animals by irritation of the cervical sympathetic nerve. The association of the thyroid syndrome and the sympathicotonic syndrome is easily understood on considering the physiologic relations between the thyroid and the sympathetic system. Each may act on the other, and set up a vicious circle, but each of the two syndromes can develop alone, as they show by some cases reported. In three of their cases tuberculosis seemed to be the primary factor. Labbé examines the basal metabolism by means of a war gas mask, with Tissot valve, spirometer and Laulanié's eudiometer. This combination, he says, allows greater precision than the Haldane apparatus. The hyperglycemia is tested with the Bang method.

Appelmans, R. The Place of the Thryoid Gland in Anaphylaxis. [C. R. Soc. de Biol., Dec. 9, 1922, p. 1242. B. M. J.]

R. Appelmans has endeavored to confirm the statement of Képinow, who found that in animals from which the thyroid gland had been removed the injection of the dechaining dose after previous sensitization failed to bring about anaphylactic shock. On a series of eleven animals—presumably guinea-pigs—a sensitizing injection of 0.04 c.c. of human serum was made. In three of them thyroidectomy was performed 2, 7, and 11 days previous to the injection; in two of them thyroidectomy was carried out at the same time as the injection; in four of them thyroidectomy was performed 2, 2, 7, and 8 days after the injection; while the remaining two animals were used as nonthyroidectomized controls. At a period varying from 17 to 24 days after the sensitizing dose, the dechaining dose—0.05 to 3 c.c. in quantity—was injected into either the heart or the peritoneum. In every case typical shock occurred, and, with the exception of two of the animals in which the thyroid had been removed

subsequent to the sensitizing injection and one of the controls, all of them died. All the animals were examined post mortem, and in only one was any vestige of the gland to be found—and this in one of the fatal cases. From these experiments it is concluded that the thyroid gland plays no part in the phenomenon of anaphylaxis. This conclusion, it may be noted, can only be held valid for the particular species of animal investigated.

Stoll, H. F. Basal Metabolism in Hyperthyroidism. [Boston Medical and Surgical Journal, Vol. CLXXXVII, No. 4, p. 127.]

More evidence showing that variations in basal metabolic rates are not due solely to diseases of the thyroid. Careful anamnesis and thorough clinical examination should always precede the biochemical tests. There are borderline cases, however, in which the metabolic rate will prove very helpful. In conjunction with the usual clinical signs of toxicity the basal metabolic rate assists materially in deciding what form of therapy is more advisable. As changes in the metabolic rate frequently precede changes in the clinical picture, metabolism estimations at stated periods afford a valuable means of checking any therapeutic measure, either medical or surgical.

Parisot, J., and Richard, G. The Sign of the Thyroid. [Bulletins de la Société Médicale des Hôpitaux, Paris, Vol. XLVI, No. 17, p. 806.]

The effect on the heart of thyroid injections was studied in 17 cases of hyperthyroidism, in 11 with other thyroid disturbance, 32 with normal glands, and 12 with hypothyroid stigmata. The reaction depends on the relative activity of the vagus or the sympathetic system. One reaction was constant and capital in hyperthyroidism, namely, a pronounced slowing of the pulse, after thyroid in large doses. This constant reaction is called the *sign of the thyroid.* The systolic blood pressure usually declined also, and the oculocardiac reflex was exaggerated. It is of special value in estimating the possibility of thyroid participation in a complex polyglandular syndrome.

Sestini. The Thyroid Gland and Immunity. [Lo Sperimentale, Vol. LXXIV, p. 1–3.]

An experimental research to determine what part if any the thyroid gland takes in the processes of immunity. He took 15 animals, used 4 as controls and vaccinated 11 against typhoid. The vaccinations were made in the peritoneum at intervals of about a week. When examined later the thyroid was found to be in a condition of hyperfunction, with an increase in lipoids, in fuchsinophil granules, and changes in the colloid —a true state of teleangectoid hyperplastic struma. It is difficult to say whether the thyroid formed antibodies, but the hyperplastic struma points to an increase in the internal secretion of the gland from hyperproduction of hormones, which through the nervous system might act on the cells of different organs at a distance.

Kimball, O. P. Prevention of Simple Goiter in Man. [American Journal of Medical Sciences, Vol. CLXIII, No. 5, p. 634.]

A plea for prophylaxis as a public health measure. Education of the pupils could be combined with the actual administration of iodin, so that after leaving school they could continue the treatment if necessary. As thyroid enlargement is approximately six times as frequent in girls as in boys, each community must decide whether it will include both sexes in prophylactic measures, as it must also decide regarding the ages when the use of iodin should begin and end. Between the ages of eleven and seventeen years, beginning with the fifth grade, is the principal period.

Hammett, T. S. Studies on Thyroid Apparatus IV. [Am. Jl. of Anat., XXXI, No. 2.]

The removal of the parathyroid glands from the albino rat resulted in a marked and valid increase in the size of the submaxillary glands. This result does not follow thyroparathyroidectomy. Hence, in Hammett's opinion, the cause of the enlargement is not attributable to any local irritation produced by the operative procedure. It is possible that the hypertrophy or hyperplasia is a response to an increased functional activity induced by the increased neural irritability resulting from the removal of the parathyroids.

Tsuji, K. Thyroid Function on Different Diets. [Acta Sch. Med. Univ. Imp. Kioto, Vol. IV, No. 4.]

This clinical experimental study aims to determine whether diet, as such, can specifically influence thyroid function. Rats which have been fed on large quantities of egg-yolk or milk show a definite hypertrophy of the thyroid. Hypertrophy of various organs also resulted. These organs atrophy in thyroidectomized rats, in spite of large quantities of egg-yolk or milk in the food. These substances therefore act on the thyroid in a similar way as iodin (or possibly by reason of their iodin content).

Marañon, G. Red Thyroid Spot. [Bull. d. l. Soc. Méd. d. Hôp., XLVI, No. 34.]

The well known reddening of the skin by rubbing or from pressure in the hyperthyroid patient is here made the object of a special study. He discusses the relation of this sign to Lian's local hyperesthesia in hyperthyroidism and to other problems of dermographism.

Rowe, E. Roentgen Treatment of Toxic Goiter. [Nebraska State Med. Jl., Jan., 1923.]

There has been great advancement in the knowledge of thyroid disease. The number of patients seeking relief by nonsurgical means is large. It is important to determine by scientific investigation the possibility of successful treatment by roentgen ray. The surgeons are some-

what hostile to treatment by the X-ray, chiefly because roentgenologists have entered into direct competition with them in a field that has been largely surgical. Internists have seized upon the method of treatment and are offering assistance by studies in metabolism and the problems which have to deal with thyroid disease. The whole problem of thyroid intoxication is bound up with the problem of the manufacture, storage and use of thyroxin, which is a chemical production of the thyroid gland. The many types of pathological changes in the thyroid gland may be summed up as colloidal, adenomatous, and exophthalmic. All other changes are but the usual tissue changes which might occur in any organ under the same circumstances. There are no pathognomonic changes determining the state of thyrotoxicosis. Many case records illustrated by charts show by pulse, weight and metabolism the changes which patients undergo while taking the Roentgen treatment. It is definitely observed and the opinion based on this study, that the X-ray will accomplish as much as the surgery. It may require a longer time, but the results are just as good and the mortality is nil. The charts show the published records of Drs. Means and Aub, and others who have been working along these lines. Most types of toxic goiters are amenable to Roentgen therapy. The contraindications are (1) Colloid, cystic, fibrous and nodular goiter, without toxicity. (2) Goiter causing marked pressure without symptoms. (3) Intrathoracic goiter. The treatment of thyroid intoxication is major roentgenological work. Improvement is first noticed by a reduction of pulse rate, increase in weight, improvement in nervousness and insomnia. In about 50 per cent the exophthalmos will eventually disappear. In most cases it improves. In some it does not appear. Thyroid enlargement is one of the last objective signs to disappear. The end results depend entirely on the damage done, when the hyperthyroidism disappears. If degeneration of heart muscle and nephritis occur, improvement is often great, but a complete cure cannot be expected where these changes have occurred. All patients should have metabolism rate taken both for diagnostic purposes and from time to time in order to follow the treatment. [Author's abstract.]

Richardson, Edward P. Relative Value of Surgery and Roentgen Ray in the Treatment of Hyperthyroidism. [J. A. M. A., Vol. LXXXIV, March 24.]

This author states that a comparison of the cases treated by roentgen ray and those treated by thyroidectomy shows that the average results in all cases treated by subtotal thyroidectomy are better than the results in a selected two-thirds of the cases treated by roentgen ray. The metabolism shows a drop to about + 10, as compared with + 20 for the roentgen-ray cases; the pulse, a drop to 80, as compared with 90; the weight, a tendency to more persistent and greater increase. The rate of fall in metabolism and pulse is about equal. The reason for this is that

in certain of the patients who underwent ligation of both superior thyroid arteries, followed by thyroidectomy in two stages, the whole of the surgical treatment required four months, and in one case eight months for completion. In nine cases treated by immediate subtotal thyroidectomy in one stage the sharp fall in metabolism and pulse and gain in weight are striking. Richardson says there can be no doubt that the average results in surgery are better than those following roentgen-ray treatment. The roentgen ray has a beneficial effect in certain cases of hyperthyroidism, but this effect is not sufficiently constant to be relied on as the sole form of treatment. In selected cases of exophthalmic goiter, the use of roentgen-ray treatment under careful control is justifiable for a period of four months, during which the patient receives about five treatments. If, after four months of treatment, the degree of improvement obtained in general condition and basal metabolic rate does not promise "cure," operation should be undertaken.

Enderlen and Hitzler. Recurrence of Goiter. [Beit. z. klin. Chir., CXXVII, No. 3. J. A. M. A.]

Statistics are given showing recurrence in 29 per cent of 795 cases followed to date, with operative treatment of the recurrence in 9 per cent. To avoid recurrence, a change to a region free from endemic goiter might be considered. It is possible that the absence of recurrences in the records of certain surgeons may be due in part to the locality being free from endemic goiter.

Grant, R. L. T. Basal Metabolic Rates in Exophthalmic Goiter. [Med. Jl. of Australia, II, No. 25.]

Increased basal metabolism was constant in the findings of this author. He is an advocate of the surgical versus the medical treatment of exophthalmic goiter. The basal metabolism of ten cases of exophthalmic goiter and one case of toxic goiter was studied by Grant.

Schwensen, C. Auricular Fibrillation in Hyperthyroidism. [Uges. f. Laeg., LXXXIV, No. 50. J. A. M. A.]

Subsidence of auricular fibrillation after operative treatment of exophthalmic goiter has been reported by Fridericia and others. Schwensen reports a case associated with irregular heart action and auricular fibrillation. The heart beat was 160, the radial pulse 100. After roentgen-ray treatment, the symptoms became much aggravated for five weeks but then improved, and the electrocardiogram soon became entirely normal. The right ventricle returned to normal size at the same time.

Lang, F. J. Death from Goiter. [Klin. Woch., Dec. 9, 1922, I, No. 50.]

The author discusses the causes of death in goiter. Toxic action on the phrenic nerves; persistent thymus; compression of trachea; are the chief factors involved. The function of the nonstriated musculature of

the lung is one of the important factors to be considered, but this he does not adequately analyze.

Bircher, E. History of Iodin Treatment of Goiter. [Schweiz. med. Woch., Vol. LII, No. 29, p. 713. J. A. M. A.]

Bircher remarks that according to the Swiss newspapers and the medical press, iodin prophylaxis and treatment of goiter is the most important discovery of recent decades. Physicians and school teachers and others are vying with each other in giving iodin to those in their charge, but, he says, the harm wrought by this in cases of goiter is already so great—much of it irreparable—that this abuse of iodin must be halted before it is too late. He recalls that burnt sponge was used in treatment of goiter from the earliest days of history, and its value is in the iodin it contains. Hippocrates, Galen, Pliny mention it, and the Chinese used it fifteen centuries before Christ. Iodin was isolated in 1811, and Coindet extolled it in treatment of goiter in 1820. He warned, then, that the patient taking it must be kept under close medical supervision. During 1920 Bircher encountered thirty-six cases of severe thyroid derangement for which iodin treatment was responsible. It had been taken under advice of a physician in some, of a druggist in others, with self-drugging in the rest. In one woman of forty-two with goiter 20 gm. of potassium iodid in the course of twelve weeks was followed by intense nervousness and excitement, tremor, salivation and palpitations, pulse reaching 116, and slight hemiplegia. On account of the heart disturbances—the exaggeration of which had been the indication for the treatment—Bircher did not dare to operate, and necropsy soon after revealed 380 mg. of iodin in the thyroid, which weighed 400 gm. The goiter had developed many years before in connection with a childbirth. The operation in these cases was always exceptionally difficult and tedious. The physiologic iodin content of the thyroid is from 2 to 9 mg., he adds; in these cases it reached 20, 30, and in the above case, 380 mg. Over 50 per cent of internally treated goiters return in one, two or three years, and the surgeons report a similar proportion of recurrences after thyroidectomy. We must bear in mind further that exophthalmic goiter proves fatal in an average of 25 per cent of the cases. Notwithstanding the extensive research on iodin and the thyroid in the last hundred years, the physiology and pharmacology of iodin is so uncertainly known and the experiences with it have been so contradictory that it seems like a dangerous experiment to give this metallic poison, in food or drinks, on an extensive scale and for long periods. To give it indiscriminately to the iodin-refractory and the iodin-susceptible, the thyroid sound or pathologic, is an irresponsible procedure. He says of the Ohio experiment with iodin prophylaxis in the schools that it is far from convincing, as also similar experiences in Switzerland. He calls attention further to the differences between goiter in America and in Switzerland, and cites

figures from different regions in Switzerland showing goiter in 72 to 100 per cent of the school children, while all but 3.3 to 9 per cent of the recruits from those regions were free from goiter.

Zandren, Sven. The Heart in Myxedema. [Zent. f. Herz u. Gefäss., July, 1922.]

Sven Zandren finds that the characteristic symptoms referable to the heart in myxedema are the following: (1) Dilatation of the heart in both directions, no signs of a valvular defect or of myocarditis and a normal or subnormal blood pressure. (2) Subjective symptoms of dyspnea and palpitation may exist for a long time unchanged. Gradually there develop edemas, localized mainly in the lower parts of the body which reach enormous dimensions; the skin becomes thickened, it cannot be lifted in folds and it is cold and scaly. (3) There is a disproportion between the objective findings in the heart and the pronounced edema with the severe subjective symptoms of insufficiency. (4) There is no or only a slight therapeutic effect noticeable from the usual treatment of the heart, but an excellent result is seen from the administration of thyroid gland preparations. (5) In many cases it is possible to demonstrate slight somatic or psychic symptoms of hypothyroidism.

Fleming, G. B. The Respiratory Exchange in Cretinism and Mongolian Idiocy. [Quart. J. M., LXI, 11. Med. Sc.]

In the untreated cretin the basal metabolism is unduly low, but is raised to a normal level by thyroid treatment. In six Mongolian idiots the basal metabolism was found to be normal, and thyroid treatment had no effect.

Talbot, F. B., and Moriarty, M. E. Basal Metabolism in Cretinism. [Am. Jl. of Dis. of Child., XXV, No. 3. J. A. M. A.]

Talbot and Moriarty show, first, that determinations of the basal metabolism make possible an early diagnosis of cretinism, before the usual clinical symptoms appear; second, the correct standard to use in childhood in determining whether a subject is suffering from hypothyroidism or not, and third, that determinations of the basal metabolism are of distinct value in indicating the amount of thyroid which may be given with maximum efficiency. The basal metabolism findings in a series of ten cretins are given, and it is shown that the basal metabolism and physical development of a cretin before treatment are considerably lower than they should be, illustrating the importance of the thyroid gland as a growth promoting factor. The metabolism of the untreated and treated cretins is plotted for comparison with the normal, showing the heat production for each square meter of body surface, total calories referred to weight, and total calories with reference to age. In the majority of cases studied, the most marked clinical improvement was not obtained until enough thyroid had been given to raise the metabolism to

the expected metabolism for the age. Since the purpose of treatment in cretins is to bring them up to the average normal for the age, it seems wise to give sufficient thyroid to bring the metabolism to the expected total metabolism for the age. The evidence to date is that this level must be reached before the best therapeutic results can be obtained.

Bolk, L. Mongoloid Idiocy. [Tijd. v. Gen., Jan. 20, 1923, I, No. 3. J. A. M. A.]

The peculiar eye symptom in this disorder is due to arrested development of the epicanthus, which arrest of development may find an expression in brain structure as well. He states there is a hypothetical "hormone index," specific for each individual, and that the hormone index in mongoloid idiots differs in some definite manner. How to measure the irritating or destructive element is a biochemical problem.

Millet, J. A. P., and Bowen, B. D. Recognition and Treatment of Hypothyroidism. [N. Y. St. Jl. of Med., XXIII, No. 3.]

In this clinical paper eighteen cases of hypothyroidism are analyzed. They showed either: (a) myxedema, (b) clinical hypothyroidism, or (c) stigmata suggestive of hypothyroidism, with decreased basal metabolism and improvement under thyroid therapy. Cases falling in this third group are classified with difficulty since low basal metabolism is not specific for thyroid dysfunction. The most satisfactory type of thyroid therapy is the intravenous administration of thyroxin. Thyroxin and desiccated thyroid are uncertainly absorbed when taken by mouth, but of the two, desiccated thyroid is to be preferred to thyroid administration.

Hotz, G. Endemic Goiter and Cretinism and their Prophylaxis. [Klin. Woch., Oct. 14, 1922. B. M. J.]

G. Hotz describes the recent attempts made in Switzerland to prevent goiter. They are based on the old experience that iodine, administered in small doses for a long period, diminishes the most common forms of goiter. It is now known that only very small doses of iodine are required. It should be given for many years (during the whole period of childhood and in the years of sexual activity). Various conditions of the thyroid gland are found in cretins. The author's observations show that in early childhood the cretinous condition often develops under the influence of a large vascular active goiter, and that by the early resection of most of the goiter the cretinous condition may be arrested; the child then develops in a normal manner and increases in height. In cretinous families usually the mother or father or both parents suffer from goiter. Chemical researches respecting endemic goiter are at present in their early stages. One fact is known with certainty—that the normal thyroid gland substance, iodothyrin, iodothyreoglobulin, and thyroxin are able to prevent or diminish goiter. The prophylactic iodine treatment shows that potassium iodide has the same action. The iodine prophylaxis is

carried out in Switzerland in two ways: (1) Potassium iodide is added to the ordinary cooking salt in the proportion of 0.5 gram of potassium iodide to 100 kg. of ordinary cooking salt. This iodized salt is sold at the same price as ordinary common salt, and can be employed for household use. This prophylaxis is carried out in the cantons Appenzell and Wallis. (2) In other districts tablets, each containing 5 mg. of iodine, are given to the children in schools; one is given weekly. The reports of Bayard show a marked diminution of goiter in the districts where the iodized cooking salt is used. The reports of Steinlin and Imbach respecting 7,500 school children treated with tablets show a diminution of the number of cases of goiter. The cost of the tablets for each child for a year was one franc. Caution in the treatment is, of course, necessary, as in certain cases of goiter in adults small doses of iodine lead to symptoms of Graves' disease.

Ugon, A. Armand. Congenital Myxedema. [Arch. Lat.-Amer. de Ped., XVI, No. 9.]

A clinical report of a young cretin whose mother had had a goiter for twenty-two years with slowly developing hyperthyroid symptoms. Therapy begun at the age of eleven had produced good results.

Lisser, H. A Case of Adult Myxedema and One of Childhood Myxedema. [The Medical Clinics of North America, VI, No. 2, p. 327.]

The first patient was a man of thirty-eight years, whose illness dated back fifteen years. At that time he began to notice puffiness involving pretty much the entire body and he became very drowsy. He slept from twelve to fourteen hours during the night and often several hours during the day as well. About eight years prior to admission, his speech became thick, havy and slow, and the intonation of his voice became very deep and low. Also about this time his hair began to fall out, leaving him quite bald. The hair on his body for the most part disappeared. He shaved only twice a week. He never perspired and always felt cold, requiring blankets in immediate contact with his body at night.

On examination, the skin was cold, very dry, quite thick and rough, with a little scaling. His complexion showed the characteristic "Christmas-red-apple cheeks." The axillary, pubic and body hair was quite scanty. His face was round and the features thick and puffy. The pulse varied between 52 and 64. The extremities were thick and looked edematous, but there was very little pitting on pressure. The temperature was 95° F. (35° C.). The basal metabolism measured 45.2 per cent below normal.

This patient was treated with thyroxin, and spectacular improvement took place from the very beginning. After nine months of treatment, he was a new individual. He had a growth of hair on his scalp; his weight

had decreased 25 pounds; his temperature had come up to normal; his puffiness had entirely disappeared; his facial expression was bright, alert and cheerful; his voice was higher pitched. He was back at work and felt perfectly well.

The second patient, a female of fourteen years, likewise showed all of the physical attributes characteristic of myxedema. In addition, she was retarded mentally, measuring only seven years on the Binet-Simon scale. This child was treated with Burroughs and Wellcome's tablets of thyroid extract, the dose varying from 2 to 7½ grains (0.130 to 0.4924 gram) per diem. The results of treatment in this patient were gratifying in some particulars; but her skeletal growth was slight, and her intellectual advancement, as measured by the Binet-Simon scale, was practically nil.

Urechia, C.-I., and Grigoriu, C. Extirpation of the Pineal Gland. [C. R. Soc. Biologie, July–September, 1922, p. 815.]

These authors have successfully removed the pineal gland from a couple of cocks, and have been enabled to study the changes subsequently ensuing. After the operation the birds presented an involution of the secondary sexual organs lasting approximately for two months; when this period had elapsed growth set in rapidly, and the development of these organs became well marked. Eight months after the extirpation of the gland the animals were killed. They presented on inspection no difference from the controls of the same generation. The weight of the testicles was the same, but the interstitial tissue was in greater abundance in the operated animals. As regards the pituitary, this gland was found to be considerably enlarged, being about three times the size of that common to normal cocks. On microscopic examination it was possible to substantiate an increase in the acidophilic cells, the presence of numerous acini filled with acidophilic colloidal material, and a simple hypertrophy of the nervous lobe. The conclusion is drawn from these two experiments that the result of the removal of the pineal gland was to increase the size of the pituitary, and probably to stimulate its function.

Lereboullet, P. Pathology of the Pineal. [Paris letter, J. A. M. A., Vol. LXXXIII, Aug. 4.]

The pathology of the pineal body is not only more limited but also less clearly marked. It is characterized by three types of manifestations: (1) a dystrophic syndrome evidenced by accelerated growth, the height rapidly reaching the maximum but not exceeding it; there is no sign of giantism, but occasionally nanism will be observed; the precocious development of the genital organs and increased pilosity accompany rapid growth and are often very marked; (2) a nervous syndrome, characterized by cerebral hypertension, together with headache, vomiting, convulsions, disturbances of vision, etc., to which are added certain signs revealed by lumbar puncture and notably hypertension of the cerebrospinal fluid, and

(3) a peculiar ocular syndrome, distinguished by partial paralysis of the rotary muscles of the eye, due, according to Spiller, to a lesion of the anterior corpora quadrigemina. With this triple syndrome may be combined certain contingent factors: obesity and polyuria, which may be due to a secondary involvement of the floor of the third ventricle. A third sign is closely related to those characteristic of precocious puberty; namely, precocious mental development quite superior to that of children of the same age, as has been noted in several instances.

Lepehne, G. Physiology and Pathology of the Spleen. [Deut. med. Woch., XLVIII, No. 48.]

Lepehne reviews the function of the spleen as an organ which serves partly as a "regionary lymphatic gland of the blood" (Helly), partly as an endocrine organ influencing the production of blood cells, and partly in relation to the metabolism of iron and cholesterol. The destructive action on red corpuscles and platelets and the question of production of antibodies are especially discussed.

Widal, F., Abrami, P., and de Gennes, L. Colloidoclasis and the Endocrine Glands. [Presse Médicale, XXX, p. 385. J. A. M. A.]

Widal and his coworkers report a further instructive example of instability of the colloids, and treatment of this colloidoclastic diathesis. The asthma was traced to ovarian disturbance, followed by thyroid malfunctioning, and on the basis of this endocrine derangement an anaphylaxis to various substances, especially rose pollen, developed, entailing asthma. It began at puberty. Treatment was begun after twenty-six years and the effect of thyroid treatment and of desensitization has been most remarkable. The symptoms can be banished and brought on again at will by treatment and by suspension of treatment.

Weil, P. Emile, et al. Blood Test of Liver Functioning. [Presse Médicale, Vol. XXX, No. 52, p. 553. J. A. M. A.]

Whenever the liver is seriously pathologic the blood is profoundly altered, and coagulation does not occur as in normal conditions. Weil and his coworkers list seven various abnormal features of coagulation as determined in a large number of cases of liver disease. They call this the syndrome hémocrasique des hépatiques, and state that it can be estimated by the bleeding time. This is exaggerated and irregular with liver disease, and this is one of the earliest signs of any infection or intoxication modifying liver functioning. The blood coagulates less readily, there is less retraction of the clot, and the clot crumbles or is redissolved—all of which is manifest in the changes in the bleeding time. The curve of repeated bleeding-time tests shows the great spontaneous irregularity, fasting, especially in females, and above all when there is a tendency to hemorrhage. The curve of the bleeding time can be instructively supplemented by determining the fibrinogen content, refraction,

and the viscosity of the plasma, but even without these, the bleeding time curve alone will throw light on important functions of the liver hitherto left unexplored in the clinic.

Mann, F. C., and Magath, T. B. Physiology of Liver. [Archives of Internal Medicine, Vol. XXXI, No. 1, p. 73]

After total removal of the liver in animals there is a marked and progressive decrease in the blood sugar. The glycogen content of the muscles also decreases. A characteristic syndrome then develops until death.

Wechsler, I. S., and Brock, Samuel. Six Cases of Dystonia. [Am. Arch. Neur. and Psych., Vol. VIII, No. 5.]

A study of six hitherto unreported cases of dystonia with numerous unusual and atypical features. An attempt is made to enlarge the concept of the disease entity and to include in it a myostatic form, as contrasted with, and as a counterpart of, the recognized myokinetic type. Additional clinical and physiological evidence is adduced to support the concept of a myostatic variant. Partial and almost total decerebrate postural disturbances are demonstrated in the cases herein reported, and form a characteristic part of the syndrome. This adds further weight to the existence of the myostatic component and is of aid in delimiting the anatomical level. An abstract of the cases follow:

Case I — of dystonia musculorum deformans of the kinetic type beginning in the right hand and, up to the present, involving the musculature of both upper extremities, neck and head, with a fragment of decerebrate rigidity phenomena.

Case II — of dystonia musculorum deformans of the kinetic type with the occurrence both of fragmentary and almost complete decerebrate rigidity phenomena.

Case III — of dystonia musculorum deformans with (1) a remarkable familial incidence, (2) speech disturbance, (3) a remission of the hyperkinetic phenomena with a resultant, (4) myostatic residuum, (5) a hemidystonic distribution and (6) a fragment of decerebrate rigidity.

Case IV — of dystonia musculorum deformans, illustrating the myostatic or postural form, with very few hyperkinetic phenomena.

Case V — A postural or static instance of dystonia musculorum deformans (dysbasia lordotica progressiva) with very slight kinetic involvement.

Case VI — of dystonia musculorum deformans of the kinetic type revealing (1) fragments of decerebrate rigidity, (2) a paralysis agitans-like tremor of right thumb and hand, (3) a dorsal extension (Babinski) of the left big toe.

Their conclusions are: (1) There exists a myostatic variety of dystonia musculorum deformans as contrasted with the usual myokinetic form. (2) Phenomena of decerebrate rigidity may frequently be observed

in dystonia musculorum deformans. (3) All cases of dystonia have an underlying postural background, one of the manifestations of which are the phenomena of decerebrate rigidity. (4) The myostatic and myokinetic phases of dystonia, which may be observed in all cases, are capable of dissociation. Either the static or kinetic phase may dominate the clinical picture. (5) The involvement in dystonia may be segmental in character. (6) In dystonia musculorum deformans there are some features found of other striatal diseases, which serve to emphasize their basic relationship. [Author's abstract.]

Marfan, A. B. Thymus Death. [Paris Méd., XII, No. 44. J. A. M. A.]

Marfan believes that there are many causes of sudden death in young children. Some sort of autointoxication in eczema may be the cause, while it is probably a local lesion of the superior cervical ganglion in cases of retropharyngeal abscess, etc. The only thing which these and other sudden deaths have in common is a certain predisposition of the young organism for it. Marfan describes a case of a rachitic girl of twenty-one months, who had suffered from several attacks of epileptiform convulsions before. The child was in a hospital under observation for a few days, and died suddenly, just while she was being dismissed as perfectly healthy. She had an enlarged thymus (35 gm.). The heart was in systole. The real thymus death is not due to compression of organs. It happens chiefly under anesthetics. The victims are usually pale and fat children, with rickets and enlargement of lymphatic glands. Marfan considers the causes of it as identical with the causes of rachitis, and recommends specific treatment if indicated by the Wassermann and tuberculin tests.

II. SENSORI-MOTOR NEUROLOGY.

4. PONS; CEREBELLUM.

Bakker, S. P. The Association-System in the Cerebellum. [Nederlandsch Tijdschrift voor Geneeskunde, LXVIII, Sept. 6, p. 1341.]

Bakker reports to the Amsterdam Neurologists' Society the results of his experimental work on the association-system in the cerebellum of rabbits. By the studies of Brouwer and Coenen the association-system of the flocculus was made known, but facts concerning the vermis and the hemispheres are wanting. Bakker made a superficial lesion of the cerebellum without damaging the nuclei. After three weeks Marchi's method was used. In a lesion of the hemisphere degenerated fibers are seen to run near to the vermis, along the commissures dorsally of the nuclei, to the contralateral hemisphere and the adjacent flocculus. Massa's bundles are to be followed to the nucleus dentatus, while some in the region

of the fibre perforantes penetrate the region of Deiters' nucleus. In a small experimental lesion of the vermis it appeared that the degeneration ran not only to all the lamellæ of the vermis which were undamaged but also to the hemispheres and to a less extent to the flocculus. The degeneration was to be followed chiefly to the nucleus emboliformis, while there was hardly any going to the nucleus dentatus; it could be followed to Deiters' nucleus on both sides. [Leonard J. Kidd, London.]

Morquio, L. Necropsy Findings in Friedreich's Disease. [Arch. Amer. Med., 1925.]

In this boy of eleven years under observation for more than a year who died from typhoid there had been pain and weakness of the legs for about a year. These pains did not spread, and they occurred only in the knees and when walking. There was a swaying gait of a cerebellar ataxia type and the speech was impaired. Necropsy showed intact cerebellum. The lesions were chiefly confined to the spinal cord.

Earl, C. J. C. Cerebellar Haemorrhage in a Boy. [Irish Journ. of Med. Sci., Series 3, No. 33, p. 502.]

A boy of eleven, of good antecedents, was perfectly well till within 24 hours of his death from cerebellar hemorrhage. He was chopping wood and was called in to go to bed; immediately he entered the house he complained of violent headache, and vomited but had no vertigo; from that time he did not speak intelligently. For eight hours he vomited almost incessantly, and then became quiet and unconscious. Seven hours later he became violent, throwing his limbs about wildly. No evidence was found of any cranial nerve palsies, so far as his strong purposeless movements in all his limbs permitted. Pupils of moderate size, equal and active. No deviation of head or eyes. No paralysis. He responds sharply to painful stimuli. All reflexes plus, but equal on the two sides. Abdominal reflexes absent, and bilateral extensor plantar responses. No hypotonia. No neck-rigidity; no Kernig sign. A provisional diagnosis was made of encephalitis lethargica fulminans. Death two hours after admission. Necropsy showed absence of injury or fracture, and no disease of middle or of internal ear or of the sinuses. Meninges congested; left side of brain edematous and larger than right. A massive hemorrhage in left cerebellar lobe, completely filling it and obliterating its structure. Brain otherwise normal, except for the edema. No evidence of syphilis. [Leonard J. Kidd, London.]

Zylberlast-Zand, Madame Natalie. A Case of a Sensory and Trophic Syndrome of Pontine Origin. [Revue Neurologique, An. 31, T. 2, No. 6, p. 596.]

The symptoms consisted of a weakness of the left upper and lower extremities; sensory disturbances most marked in the first three fingers and the radial half of the left hand and forearm; pain in the left arm

and right side of the face; an increase of the vestibular reflex on the right; trophic changes consisting of hyperkeratosis, edema and cyanosis of the skin in the parts affected by the sensory change; and some myotonia in the left side of the neck and the left hand. The sudden onset of the symptoms, without fever, led to the diagnosis of a small hemorrhage situated in the pons. [Camp, Ann Arbor.)

Freeman, W., and Morin, P. Mesencephalic Automatic Reflexes. [Revue Neurologique, An. 31, T. 1, No. 2, p. 158.]

Postural tonic reactions are due to mesencephalic reflexes. In athetosis one may observe the signs of decerebrations and in fact athetosis is the changing postures of decerebrate rigidity, manifesting the liberation of the mesencephalon from the control of superior centers. [Camp, Ann Arbor.]

Porges, O. Pylorospasm in Case of Cerebellar Tumor. [Wiener klin. Woch., Feb. 5, 1925.]

A clinical observation in which pylorospasm seemed to be associated with the cerebellum in a patient with a cerebellar cancer metatasis. There were also lesions in the dorsal nucleus of the vagus.

Van Rijnberk, G. Recent Research on Cerebellum. [Ned. Tijd. v. Geneeskunde, July 26, 1924.]

A critical review, richly illustrated, of the present day conceptions concerning cerebellar structure and functions.

Saito, M. Experimental Investigation on the Connections of the Cortex Cerebelli with the Pons, Medulla Oblongata, and Intrinsic Cerebellar Nuclei. [Arb. a. d. Neurol. Inst. Wien, XXIII (H. 3), 74.]

Saito, M. Further Investigations on the Intrinsic Connections of the Cortex Cerebelli. The Anterior Lobe. [Arb. a. d. Neurol. Inst. Wien, XXIV (H. 1), 77. Med. Science.]

Experiments were made in rabbits with the following results: the cortex of the lobus petrosus cerebelli is connected with the superior cerebellar peduncle, while that of the lobus paramedianus is connected with the middle cerebellar peduncle. The fibers which effect this connection end in the lateral nucleus and form a homolateral path between cortex cerebelli and pons. No degeneration of this path occurs in rabbits after lesions of the vermis. Whether a similar connection exists between cortex cerebelli and inferior cerebellar peduncle cannot be stated with certainty. The medulla oblongata, however, is connected with the cerebellum by means of the so-called perforating fibers which, lateral to nucleus tecti and mesial to nucleus dentatus, take a dorsoventral course and end by arborizing in the area of Deiters's nucleus. The author con-

firms the existence of the path described by Löwy between formatio vermicularis and nucleus angularis. According to Saito, the fibers of Löwy's bundle which arise from lobus lateralis (paramedianus) have a lateral situation, while those arising from the vermis have a mesial position, and they all end among the cells of the restiform body. The author confirms Clarke and Horsley's observations regarding the connections of the vermis and lateral lobe with the vestibular nucleus, and of the cortex cerebelli in general with the intrinsic cerebellar nuclei. The same can be said as regards the arcuate system of Clarke and Horsley, though according to Saito the connection between the lateral lobe and formatio vermicularis is more intimate than described by these authors. In the rabbit all the intrinsic cerebellar connections are more intimate than in the dog and cat.

The cortex of the anterior lobe of the cerebellum has in the rabbit a special connection with the paraflocculus. After extirpation of this lobe degeneration of nerve-fibers occurs in the nucleus tecti and, in a smaller degree, in the nucleus emboliformis and area of the Deiters nucleus. [C. da Fano.]

Roussy, G., Levy, G., and Bertillon, F. Cerebellar Hemisyndrome with Intention Tremor and Athetoid Movements, Probably Due to a Lesion in the Superior Portion of the Red Nucleus, Rubrothalamic. [Revue Neurologique, An. 32, T. 1, No. 1, p. 29.]

The lesion was probably vascular. The cerebellar symptoms, localized on the right side, were: asynergy, dysmetria, adiadokokinesia, intention tremor and hypotonia. The athetoid movements were present in the right foot. The right hand has an abnormal position. There was slight weakness on the right. Temperature sense was increased and vibratory sense diminished on the right. [Camp, Ann Arbor.]

Pekelsky, A. The Nuclei of the Raphe and Neighboring Portions of the Reticular Formation. Part I. Mammals. [Arb. a. d. Neurol. Inst. Wien, XXIII (H. 3), 21. Med. Sc.]

The nuclei termed by the author "derivatives of the reticular formation" comprise the *nucleus funiculi anterioris* and the *nucleus interfascicularis hypoglossi.* The nucleus funiculi anterioris is situated dorsally to the mesial accessory olivary nucleus and was first described by Obersteiner in man; it was found by the author in various mammals, in which it undergoes various modifications in size and aspect. The nucleus interfascicularis hypoglossi is situated along and among the issuing fibers of the hypoglossus, and consists of relatively small and pale cells readily distinguished from the large and well-stained motor cells of the reticular formation. It corresponds to Jacobsohn's nucleus sympathicus sublingualis and is found in most mammals, being particularly plain in the cat. A similar group of cells can occasionally be seen (*e.g.,* in the pig) among the issuing

fibers of the abducens. The chief part of the mesial portion of the reticular formation is occupied by the *nucleus centralis inferior,* which is situated dorsally to the inferior olivary nucleus and reaches in man and higher mammals the dorsal longitudinal bundle; in rodents and other lower mammals it hardly reaches the predorsal bundle. In these animals the nucleus has, therefore, a ventral situation and a triangular shape the base of which conforms with the inferior olive; when in upper sections of the medulla oblongata the olive disappears, the ventral position of the nucleus becomes even plainer. It then corresponds to Winkler's nucleus ventralis formationis reticularis. In carnivora and rodents the nucleus continues orally till the motor nucleus of the trigeminus, but in other mammals it ends at about the level of the knee of the facial. The nucleus centralis inferior consists of small and large cells, the latter being less numerous than the former in man and higher mammals. Some of the small cells of the raphe probably belong to this nucleus, while others seem caudal prolongations of the nuclei pontis. In fact they form simple nests of cells and not a true nucleus as described by Jacobsohn in man (nucleus pallidus raphes) and by Kohnstamm in the rabbit. The nucleus centralis superior has an homologous situation and likewise consists of small and large cells, the latter gradually diminishing in higher mammals and almost completely disappearing in man.

Among the nuclei of the reticular formation, caudal and oral prolongations of the nuclei pontis are found. The principal caudal prolongation gives rise to the arcuate nucleus, which occurs not only in man (Kölliker, Zingerle) but also in certain other mammals, as the elephant. According to the author the nucleus retro-pyramidalis of Cajal and Déjérine (Ziehen's nucleus conterminalis) should be considered as homologous to, if not identical with, the arcuate nucleus because of its connections with the external arcuate fibers. This nucleus is found in rodents, carnivora, and ungulata. The principal oral prolongation of the nuclei pontis is the nucleus reticularis tegmenti, which is particularly well developed in man. Within it Ziehen observed another nucleus which he termed nucleus pterygoideus; the author finds that the Ziehen nucleus is more readily identified in monkeys and other mammals because of its large nerve-cells; he therefore proposes calling it *pars magnocellularis* of the nucleus reticularis tegmenti. This nucleus probably corresponds to the paramesial group of Borowieki and was described by Kappers in the cat; but the author cannot agree with Kappers as to its identification with Hoevell's nucleus reticularis superior ventromedialis. The nuclei of the raphe and neighboring portion of the reticular formation are in small part also due to prolongations of the central grey matter. Such are the outlying portion of the nucleus funiculi teretis, which is particularly well developed in certain mammals, and the cells which continue ventrally the nucleus dorsalis of the raphe and form in a more oral situation a defined group on each side of the Sylvian aqueduct; this group is probably a stage in the

development of the nucleus lateralis aqueducti, which the author has identified in a considerable number of mammals. From the physiological point of view the nuclei described may be considered as the central stations of some of the labyrinth reflexes described by Magnus and de Kleijn. [C. da Fano.]

Simonelli, G. Microscopic Examination of Cerebella in Which Lesions of the Lobus Posterior Had Been Experimentally Produced, With a Consideration of Ingvar's Doctrine of Cerebellar Function. [Rev. Neurol., 1924.]

In a notice of Ingvar's paper in *Brain* on cerebellar localization (*Medical Science,* 1924, IX, 385), reference was made to his view that certain immediate results of acute experimental cerebellar lesions could not be regarded, following Luciani and Simonelli, as "dynamic" or "irritative" symptoms. It was pointed out that Magnus had been able to show that symptoms of this nature do actually occur and that Ingvar's opinion was therefore ill-founded. In the present short paper, Simonelli discusses this question, giving reasons for not accepting Ingvar's conclusions on the point. Further, in respect of the lesions produced by Ingvar and regarded by him as restricted to the lobus posterior, he quotes his own experience to the effect that macroscopically localized lesions of this region, produced by a more delicate method than that employed by Ingvar, are associated with gross nerve-cell destruction in the roof and dentate nuclei even when these are not directly involved in the lesion. The production of strictly localized cerebellar lesions, therefore, of a kind from which conclusions as to topographical representation of the musculature in the cortex cerebelli can be drawn, appears to be impossible. This observation is of interest in considering the various theories of cerebellar localization which have been based on pathological material which has not been subjected to subsequent microscopic investigation. [F. M. R. Walshe.]

Waldorp, C. P. Cerebellar Tumor. [Rev. Asac. Méd. Argentina, 1924.]

A clinical case of tumor in the middle lobe of the cerebellum confirmed by postmortem. It occurred in a woman of twenty-eight years who did not respond to any form of treatment; removal was attempted. She died in bulbar syncope. There were alternating occurrence of the cerebellar symptoms, the prone position, with the legs extended, to relieve the intense headache, and the disturbances in the vegetative synapses for the vagus were outstanding symptoms.

Berlucchi, C. The Polymorph Cells of the Dentate Fascia of Old Animals. [Riv. di patol. Nerv. e Mentale, 1923. Med. Sc.]

The structural details discussed in this paper were first noted by Doinikoff (Journ. f. Psychol. u. Neurol., 1908, XIII, 166). He observed

that in the rabbit the cell bodies of some of the polymorph cells of the dentate fascia were provided with short and relatively thin processes which after a brief course became lost in an apparently granular material arranged like a halo around the cells. Later on, Lafora (Trab. d. lab. invest. biol., 1914, XII, 39) noticed in an old dog that some of the large pyramids of the inferior or central portion of the cornu ammonis were provided with peculiarly ramified dendrons. At a short distance from the cell body these gave rise to a considerable number of collaterals, most of which subdivided into two or more finer processes. The dendrons with their collaterals were like feathery tufts and were surrounded by an amorphous material similar to that described by Doinikoff. Lafora, having failed to observe phenomena of this kind in young dogs, thought that they were perhaps due to the old age of the first animals investigated, and tried to identify them with the so-called senile plaques of Redlich-Fischer. A few years afterwards, Del Rio Hortega (Trab. d. lab. invest. biol., 1918, XVI, 291), pointed out that the dendritic proliferation of the polymorph cells of the dentate fascia is a process common to many mammals of a certain age. In some of them, like the dog, cat, and horse, the processes arise from one or more dendrons (cells with feathery appendices), while in others, like the bull, cow, rabbit, sheep, and goat, they arise from the cell body (pluriramified cells). Del Rio Hortega showed, in addition, that the short processes in question are much more numerous and subdivide much more frequently than had previously been suspected, while the surrounding halo of apparently amorphous material is not seen whenever the impregnation of the fine processes and their minor branches is more or less complete. The phenomenon is not limited to senility, because it can be observed also in adult animals and in minor proportions even in young ones (calves, young goats). Del Rio Hortega's observations were confirmed by M. Prados y Such (Arch. de neurobiol., 1920, I, 73), who found similar cells in the polymorph layer of the dentate fascia of some monkeys and pointed out that the dendritic proliferation is not a regressive but a progressive process evolving pari passu with the somatic development of certain animals. When considered from this point of view, it has a considerable analogy with the multiple production of protoplasmic processes and other appendices observed by Cajal, Dogiel, Levi, Pizzorno, and others in certain types of spinal ganglion cells.

The conclusions now reached by Berlucchi are entirely in agreement with the results obtained by the former authors. He succeeded in impregnating cells of the kind described, by Golgi's chromate of silver method, by means of which also the neighboring neuroglia cells were stained. The numerous and presumably multiplied processes of these last showed the well-known intimate connections with small blood-vessels and capillaries on the one hand, and became, on the other, so intermixed with the fine ramifications of the proliferating dendrons as to render a discrimination between the two kinds of processes extremely difficult. [C. da Fano.]

Papilian, V., and Cruceanu, H. Cerebellum and Organic Functions. [C. R. Soc. Biol., March 13, 1925.]

In this series of experiments the cerebellum in twelve dogs was injured. Acceleration of the heart beat and respiratory movements followed, the oculocardiac and oculorespiratory reflexes became exaggerated, blood sugar and blood nitrogen were augmented. Histological examination later showed that the medulla and the brain were not included in the lesions.

Weed, Lewis R., and Langworthy, Orthello R. Decerebrate Rigidity in the Opossum. [Amer. Jl. Physiol., LXXII, 28.]

Decerebration in adult opossums was followed by the development of a true rigidity, involving the extensor musculature of neck, trunk, tail, forelegs and to a lesser extent of hindlegs. The reactions were quite similar to those of the higher mammals subjected to similar transections of the brain stem. The decerebrate adult opossum differed from the higher mammals under similar experimental conditions by exhibiting very frequently rhythmic, well-coördinated movements of progression. In the pouch-young opossums, decerebration was followed, except in the two oldest of the series (eighty-two days and eighty-nine days old), by the occurrence of progressive movements of a prolonged nature, without an extensor rigidity. In the two oldest of the pouch-young, there was evidence of a true rigidity in the intervals of quiescence between the periods of progressive movements. [Author's abstract.]

Tsubura, S. Increased Intracranial Pressures and Medullary Centers. [Brit. J. Exper. Path., V, 281. Med. Sc.]

Raised intracranial pressure acts first on the respiratory center, causing transitory hyperpnea, followed by sudden stoppage of respiration. The findings agree with those of Dixon and Halliburton. The centers next to be affected are the cardio-inhibitory and vasoconstrictor centers, in the form of an increase in the tonus and in reflex excitability. There are indications also of alterations in the cardio-accelerator and vasodilator centers. The vasoconstriction affects the whole body. There is some liberation of adrenalin, but this does not represent an important factor in causing the rise of blood-pressure. High pressures lead to paralysis of the cardio-inhibitory, and finally of the vasoconstrictor centers. The effects produced are partly the result of anemia, and partly due to the diminution of blood-flow, with attendant accumulation of waste products. [Author's abstract.]

Estable, C. Structure of the Cortex Cerebelli, with Some Physiological Conclusions. [Trav. lab. rech. biol., XXI, 169. Med. Sc.]

This long paper does not add much to our knowledge of the structure of the cortex cerebelli as expounded by Cajal's school; it is, however, worth mentioning because investigations were carried out in a number

of mammals and birds, and because it contains at the end some physiological considerations which are summarized by the author about as follows: the cortex cerebelli is endowed with at least two functions which are carried out by two distinct systems of histological elements: one formed by the Purkinje cells and climbing fibers, and one consisting of the remaining neurons and the moss fibers. Without considering the two systems as truly isolated entities, one may safely assume that the latter or "omnicellular moss fibers system" presides over the cerebellar functions of coördination and equilibrium, and that very likely the moss fibers have a vestibular and medullary origin. This does not exclude the possible derivation of the climbing fibers from the same regions. The thickness of the cortex cerebelli appears to be related to the size of the body, development of the muscular system, and conditions of equilibrium of the animals considered. In birds and Cheiroptera the layer of basket cells increases at the expense of the small stellate cells (granules of the molecule layer). The so-called baskets or nests of the Purkinje cells are entirely formed by the descending collaterals of the basket cells (deep stellate cells) of the molecular layer. The basket fibers converge towards the cone of origin of the axon of the Purkinje cells, but never anastomose or show phenomena of incrustation. The axon of the granules of the molecule layer is frequently provided with a terminal pear-shaped enlargement by means of which it ends on a protoplasmic process of a Purkinje cell; this form of synapse is analogous to that occurring between the collaterals of the basket cells and the body of the Purkinje cells. [C. da Fano.]

5. PEDUNCLES; MIDBRAIN.

Dresel, K. A Dog Without Hemispheres and Striatum. [Klin. Woch., Dec. 2, 1924.]

This well known investigator here reports upon an experimental research during which he has kept a dog alive for three months after the extirpation of both hemispheres and of the striate body. It was still able to learn things and look for food but lacked spontaneity and only showed defense flight to all stimuli. Its food had to be put into its pharynx. Unilateral extirpation was followed by menagery movements toward the operated side. Turning toward the opposite side was impossible. The substantia nigra degenerated early; no rigidity was observed, only propulsion and retropulsion in the dog operated on both sides. The differences between experimental animals and man is that without the hemispheres man behaves approximately like a dog without both hemispheres and the striate bodies. [Fortunately he does not conclude as do many pseudo physiologists who have made extirpation experiments that because his dog *lived* the removed structures were of no importance: the spleen for instance, or the tonsils, etc.]

Ratner, J. Tumor of Interbrain. [Klin. Woch., March 26, 1925.]

A clinical study with pathological examination of a case of endothelioma which was found compressing the paraventricular region and hypothalamus. Macroscopic changes were absent in the tuber cinereum, the pituitary or other endocrine glands save for an atrophy of the thyroid. Pluriglandular insufficiency symptoms had been marked.

Mella, H. Diencephalic Centers Controlling Associated Locomotor Movements. [Arch. Neurol. & Psychiat., X, 141. Med. Sc.]

The syndrome of paralysis agitans is often described as consisting of three elementary components, muscular rigidity, tremor, and the loss of what are called "automatic associated movements." These movements are supposed to be represented in and activated by the corpus striatum, and it is with the object of throwing further light upon this localization that Mella's observations have been undertaken. His experiments were all of the acute nonsurvival type, only one of his cats surviving for more than two hours. Transections of the brain were performed at various levels cephalad to the plane of the tentorium, and it was found that in the more anterior transections, approximately 10 mm. cephalad to the tentorium and severing the hemispheres and part of the basal ganglia, the animal showed moderate extensor rigidity and responded to cutaneous stimuli by the performance of reflex movements of all four limbs of a form suggesting locomotion. On subsequent transection, not more than 5 mm. cephalad to the tentorium, more marked decerebrate rigidity developed and the reflex movements mentioned above could not be elicited. Mella concludes that a mechanism controlling these "associated movements" must lie between the two planes of transection in a region comprising part of the corpus striatum and the corpus Luysii.

It is a familiar observation that decerebrate preparations in which transection has been made at the cephalad limits of the region within which it must fall to produce the rigidity often show powerful walking and leaping movements, though they do not possess the full range of reflex coördination of movement and of posture shown by the thalamus or midbrain preparations (*Medical Science,* 1922, VII, 109). In part these activities may be the immediate and stimulating result of transection, but for the rest they are reflex, and their analysis and their anatomical representation in the brain-stem have already been determined with a degree of accuracy and precision which renders us independent of Mella's experiments. It is clear, also, that the diencephalic structures invoked by him are not concerned in their production, since they occur in the midbrain preparation. Moreover, irradiation of reflex movements is not peculiar to these preparations, for it is seen in the bulbospinal animal (Sherrington).

On the other hand, it is difficult to see in what way these observations can throw any light upon the genesis of the Parkinsonian syndrome. The

reflex movements seen in the animals operated upon by Mella are in no way comparable with the so-called automatic associated movements said to be lost in paralysis agitans, nor is the rigidity of this disease comparable with that seen in decerebrate preparations in which the movements described by Mella have been abolished.

In fact, the constantly repeated statement that the peculiar facies, stance, gait, and type of voluntary movement of paralysis agitans result from the loss of a specific type of automatic associated movement having its central representation in the corpus striatum rests upon a wholly speculative basis. In addition to his tremor and diffuse muscular rigidity the subject of paralysis agitans shows a slight but appreciable lack of force, a slowness of execution, a limitation of range, and an unduly ready fatigue in all voluntary movements. There is no true paralysis, but the play of emotional expression and of gesture and the movements of arms and trunk which lend spring and life to the motor activities of the normal individual, are greatly diminished or lost, hence the characteristic facies, stance, and gait of patients with this disease. We are not, however, called upon to speak of this loss as that of a specific type of movement controlled by the corpus striatum. All that the facts allow us to state is that the movements lost are of a kind which are normally carried out with a minimum of muscular force. The energy involved in a transient facial expression must be very inconsiderable. In short, the movements lost are those which must be the first to be "damped down" and extinguished by the slow development of that diffuse muscular rigidity which later becomes the prime factor in the causation of that slowness of execution, limitation of range, and ready fatigability of movement which are characteristic of the fully-developed malady. As rigidity increases the patient's facies becomes more fixed and masklike, his movements more monotonous and restricted to the absolutely essential components, until finally, in a few instances, we see a helpless and bedridden individual fixed in a persistent and characteristic attitude of flexion. It seems possible, therefore, that the so-called loss of automatic associated movements is simply the clinical expression of a developing rigidity in the musculature, which naturally exerts its first and most striking effect upon those movements which are carried out normally with minimal force. It will be objected that the Parkinsonian facies and movement exist in the absence of any demonstrable rigidity, and cannot be attributed to this cause. It must be remembered, however, that our clinical tests for increased muscular tone are of the crudest description, consisting simply of passive movements of the limbs and the estimating of increased muscular resistance by this means. Clearly, muscular rigidity must be gross before it can be detected by this rough device, and we are not, therefore, in a position to exclude rigidity as underlying the symptoms in question. If this interpretation be correct, then the two elementary components of the syndrome are rigidity and tremor, for, although the latter has been loosely spoken of

as "rigidity spread out thin," the true relation of these two phenomena has not been elucidated by the reiteration of this aphorism, and remains obscure. It seems, then, that Mella's experiments have been directed to the cerebral localization of a type of movement in the existence of which there is no reason to believe, and are based upon hypothetical notions of the physiology of the corpus striatum for which there is no convincing evidence. [F. M. R. Walshe.]

Zingerle, H. Posture Reflexes in Man. [Klin. Woch., Oct. 7, 1924.]

Clinico-physiological résumé of the automatic changes of posture which may be induced by passive movements of the head or extremities in subjects reclining with closed eyes. Subcortical reflexes may be investigated by his technic.

Ingvar, S. On the Phylogenesis of the Midbrain, with Special Reference to the Optic Thalamus. [Deutsche Ztschr. f. Nervenheilk., LXXXIII, 302. Med. Sc.]

The optic thalamus is built according to the same general plan in reptiles, birds, and mammals, while the architecture of the cerebral hemispheres differ very considerably in these classes of animals. As is well known, the cerebral cortex of birds, for instance, is very little developed, while their corpora striata reach dimensions which, in proportion to the cortex, are almost gigantic. This means that the general plan of structure of the optic thalamus is not influenced by that of the hemispheres. The optic thalamus must, therefore, have an autonomous specific function, that is to say, independent from that of the hemispheres. [C. da Fano.]

Adler, E. Localization of Center for Sleep. [Med. Klinik, Sept. 21, 1924.]

Pathological study of a patient who had died from infectious endocarditis. She had lain in a lethargic condition for two weeks due to an embolism in the gray substance to the left of the third ventricle with abscess formation. There was also an affection of the right side and of the left hypothalamus and thalamus. The lesion he assumes may have blocked the incoming stimuli, thus affording some support to the Mauthner and related hypotheses concerning the physiopathology of sleep.

Rogers, F. T. Studies on the Brain-Stem. VIII. Diuresis and Anhydraemia Following Destruction of the Thalamus. IX. On the Relation of Cerebral Puncture Hyperthermia to an Associated Anhydraemia. [Am. J. Physiol., LXVIII, 499. Med. Sc.]

In previous papers the author has recorded the fact that destruction of the thalamus in birds is followed by rapid loss of weight and inability to maintain the temperature. Further analysis of this phenomenon shows that this loss of weight is due to an excessive loss of water through greatly

increased diuresis. Under standard conditions of feeding and external temperature water is lost at the rate of 10 to 60 per cent of the body weight per twenty-four hours as compared with 4 to 7 per cent in normal fasting birds. The more rapid the loss of water the quicker the animal dies. Simple decerebration is not followed by diuresis provided the thalamus is left intact. Traumatism of the hypophysis is not necessary to produce the effect. This is in agreement with previous observations of Bayley and Brewer, who elicited a similar diuresis by a minute hypothalamic lesion, without decerebration, and with minimal disturbances to the third ventricle. As a result of recent work the question has been raised whether some of the effects observed after experimental lesions of the pituitary might not actually be due to the accidental injuries to the base of the brain, and these observations seem to answer that question in the affirmative. In order to maintain the birds at their normal temperature of about 40° C. after destruction of the thalamus, it is necessary to keep them at a temperature of about 30° C. In such animals a hyperthermia may develop if the loss of water is sufficiently rapid and severe. It is pointed out that the hyperthermia in these experiments was induced by a cerebral lesion without involvement of hypothetical temperature-regulating centers in the corpus striatum. It has also been shown previously that complete removal of both corpora striata does not in itself lead to disturbances of temperature regulation.

Hirsch, E. Sleep Areas in the Midbrain. [Med. Klinik, Sept. 21, 1924.]

This clinical and pathological study permits the author to support an idea that lesions of the oculomotor nuclei and of the thalamus bring about lethargic conditions. He draws the wider inference of a fictional "sleep-center."

III. SYMBOLIC NEUROLOGY.

3. PSYCHOSES.

Menninger, Karl A. The Thyroid and Psychiatry. [Southwestern Medicine, Nov. 1923.]

This is a brief article contributed to a symposium on the thyroid gland, illustrating with a number of psychiatric cases that while we are as yet too ignorant of the exact rôle of endocrine elements to be dogmatic, certain deductions about the thyroid, which is apparently concerned with the physiology of the emotions, may be safely made; (1) nervous symptoms may be the first indication of hyperthyroidism (exophthalmic goiter) as well as of other endocrine diseases; (2) mental defect often arises upon a basis of hypothyroidism, and we should look for these because they can be cured; (3) insufficient and perverted thyroid secretion

may produce nervous and mental symptoms which are amenable to treatment. (Author's abstract.)

Hoffmann, H. Schizothymia-Cyclothymia. [Zschr. f. d. ges. Neur. u. Psych., Vol. LXXXII.]

Hoffmann has followed up with rich result Kretschmer's report of investigations in the Lundborg family. Preponderating schizoid anomalies were found in the family relationship of schizophrenics while in the families of the few circular cases predominantly cycloid individuals were found. Hoffmann uses the word "change of symptom" rather than "change of dominance," which he had used before, to denote the fact that not infrequently a predominantly schizoid individual later shows a cycloid character and vice versa.

Buscaino, V. M. Dementia Praecox and Some Histological Findings. [Schw. Arch. f. Neur. u. Psych., 1924.]

Peculiar grape-shaped conglomerates are found by this investigator in the white and extracortical gray substance of the brain. In dementia precox various types of amentia including delirium tremens, and in the brain of rabbits poisoned with histamin. He also found some amins in the urine of such patients, and believes that they originate in the duodenum.

Pogorschelsky, H. Mongolian Idiocy in Cousins. [Monat. f. Kinderh., April, 1924.]

These cousins aged eighteen and five months, respectively, showed definite mongoloid symptoms.

Steck, H. Neurological Researches Upon Schizophrenics. [Zschr. f. d. ges. Neur. u. Psych., Vol. LXXXII.]

Steck reports from extended investigations upon 400 schizophrenics that a large number of neurological disturbances are present quite generally in the catatonic group but a pathognomonic reflex formula cannot be assumed. Catalepsy, akinesia, hyperkinesia, the Rüssel reflex and waxy complexion and other symptoms show connection with striate disturbances and point back to the basal ganglia. Disturbance of the apparatus of the basal ganglia is effected physically as well as psychically.

Pellini, E. J., and Greenfield, A. D. Presence of Toxic Substances in Blood Serum in Morphin Habituation. [Arch. Internal Med., May, 1924.]

In this study the authors failed to find any toxic substance in the blood of dogs habituated to morphin. The blood serum of these dogs did not produce circulatory disturbances in normal animals into which the serum was injected. They dispose of a lot of rubbishy biochemical "research."

Jamin, Fr. Psychic Infantilism. [Zschr. f. d. ges. Neur. u. Psych., Vol. LXXXIII.]

Jamin discusses the frequent disturbances evident in the years before puberty, from ten to twelve in boys and seven to nine in girls. They are lassitude, divertibility of attention, disturbances of sleep, ill temper, excitability, shut-in disposition, tendency to affective outbreaks, untruthfulness decked out phantastically, terrifying dream pictures, running away, impulsive actions. He believes the cause may lie in disturbance of the endocrinous balance which often will be restored. The treatment therefore may be predominantly that of waiting.

Pierce, B. Mental States in Alcoholism. [Lancet, April 26, 1924.]

Pierce reviews the alcoholic psychoses, the effect of a single dose of alcohol on inhibition and on instinct. He suggests that the primary influence of alcohol is on the vegetative nervous system. That it produces a dilatation of the peripheral vessels is well known, and possibly it also acts on the nervous mechanisms involved in the expression of the emotions, including the endocrine organs. But where so much is vague and uncertain it is difficult to draw conclusions. Until more is known of the physiology of the nervous system and its relation to instinct, it will be impossible to speak with confidence on the mental action of alcohol.

Claude, H., et al. Dementia Præcox. [Encéphale, Vol. 19, March. J. A. M. A.]

Claude, Borel and Robin emphasize the fact that all forms of schizophrenia are not identical with true dementia precox. Three stages can usually be observed in the development of the disease: first, Kretschmer's schizoid predisposition—not a pathologic condition; then, after certain exciting causes, comes a period of schizomania—that is, losing touch with reality by living an introverted, autistic life. This is followed by a "dislocation" of psychic functions, in which an entire maladaptation of the individual occurs. This stage may be considered real dementia with total disintegration of the intellectual, emotional and volitional spheres. It should, however, be differentiated from the preceding stage of schizomania in which only the higher synthetic functions are lost. The course may be rapidly progressive from the first, or the third stage may not develop until late in life, or never.

Jacobi, W. Psychiatric Interferometric Studies. [Zschr. f. d. ges. Neur. u. Psych., Vol. LXXXIII.]

Jacobi reports some of the results obtained by the use of the Löwe-Zeiss interferometer to test the defensive ferments in psychiatric cases. The large amount of material affords support to the majority of findings by other methods. Suggestive indication was obtained of the pathological physiology of the psychoses though no light was thrown upon differential

diagnosis and prognosis. Even in normal individuals there is found deterioration of internal secretory organs but less in them, in hysterics and in the manic-depressive than in epileptic dementia, general paresis, dementia precox and amentia. The serological formulæ permitted one to assume no relation with the clinical course not even in general paresis with brain destruction. In dementia precox the chief value was found in the deterioration of the sex glands, the least in that of the brain, though even here a large number was obtained. No special types of deterioration could be found in the subgroups of dementia precox. The method shows no marked sex specificness. Closer relations with the reactions of Sachs and v. Oettingen or with those of Neumann and Hermann were not evident.

Oksala, H. Presenile Psychoses. [Ztschr. f. d. ges. Neur. u. Psych., Vol. LXXXI, Nos. 1, 2.]

Oksala reports clinically and histologically three cases which were diagnosed in the Munich clinic; two as presenile pernicious psychoses and one as anxiety psychosis. Histologically the first two cases had much in common while the third differed. Oksala does not consider the distinction from acute schizophrenic disease sufficiently clear either clinically or histopathologically but believes that a study of the heredity may furnish light.

Claude, H., and Brousseau, A. Nature of Dementia Precox. [Bulletin Méd., March 29, 1924.]

These authors distinguish two main types under the dementia precox group. One type of simple puerile self-absorption, degenerative and mental weakness of emotional nature, and a second type consisting in illusions and hallucinations complicated ideational delusions with retained but split mental activities.

Woltman, Henry W. The Mental Changes Associated with Pernicious Anemia. [Am. Jl. Psych., Vol. 4, Jan.]

Recently evidence has been produced that may shed new light on the etiology of pernicious anemia. Briefly, it has been shown on biopsy and necropsy evidence that the achlorhydria is not the result of atrophy of the gastric mucous membrane, as heretofore taught, but represents a prmiary, constitutional, familial deficiency, present from infancy. Achylia has been found to be present in a large percentage of other members of the families of pernicious anemia patients. Some of these were only four years of age. It is only on such an abiotrophic basis, supposedly, that pernicious anemia may develop. Furthermore, Naegeli has demonstrated that hemolysis is often lacking, and regards a primary bone marrow deficiency as the important conception. The frequent appearance of pernicious anemia in families may find its explanation here.

The onset of the symptoms pointing to a neurotoxic process, and the appearance of anemia, do not coincide, as a rule. It is well known that cord changes may precede the appearance of the anemia. This also holds true for the psychoses, as Langdon first pointed out in 1905, when he referred to the condition as pernicious anemia. For this unorthodoxy he was severely berated; however, the possibility is now widely acknowledged as fact.

It is possible that nervous changes may progress to a fatal issue without the appearance of anemia. Presumably we may be confronted with the paradox of pernicious anemia without anemia. It might not be an idle speculation to venture that certain cases of psychosis may progress likewise.

There must be something fairly characteristic in the mental picture of patients having pernicious anemia to prompt the observation so frequently made by internists that "these patients are different in some way from other patients; they listen to what you say, they do not argue, they raise no objections; they are almost too good." Numerous writers have referred to apathy, indolence, decreased mental work, loss of memory, delirium, stupid indifference to surroundings, to external impressions, and to the disease itself, instability, shallow confusion with impairment of ideas of time and place, abeyance of the mind, loss of inhibition, peevishness, gradual mental deterioration varied by control, patience, good temper and an angelic disposition for longer or shorter intervals, somnolence with a tendency on being aroused to exhibit a certain degree of mental confusion, particularly to surroundings, which may manifest itself in a delirium of a low, quiet type, a continuance of the dream state which the patients cannot shake off on being aroused, and which usually subsides spontaneously, or on further stimulation (Lazarus, Pickett, Langdon, Church, Siemerling, Pontoppidan, and Petrén).

While such patients do give one the impression of apathy, this condition seems to be physical rather than mental and emotional. On better acquaintance with patients having pernicious anemia one learns that they are usually depressed and apprehensive; affable like a tuberculosis patient, but without hope. Although they do not have pain, they suffer with annoying and persistent paresthesias, rapid fatigue, disturbance of taste, sore mouths, flatulence, diarrhea, and vague visceral sensations, all of which lead them to the conviction they so frequently express, that "there must be something serious the matter." Hunter is no doubt right in deprecating the appellation "pernicious," because this in itself does not instill confidence in the patient regarding the physician's ability or his own to combat the disease. A psychosis may appear at any time. Many very excellent contributions covering this subject have appeared. Those of Marcus, Barrett, and Lurie are particularly important. Barrett emphasizes the frequency of this condition in psychopathic wards. In 650 necropsies on the insane in Michigan,

pernicious anemia was found in 15 (2.3 per cent). Weisenburg gives the incidence of mental symptoms as 40 per cent, and emphasizes the diversity of reactions. In 647 cases, Cabot found 102 (15 per cent) in which there were mental symptoms: delirium in 44, delusions in 14, hallucinations in 8, dementia in 9, melancholia in 3, and mania in 3. Of 1,498 patients with pernicious anemia, who were seen in the Mayo Clinic since July, 1914, about 4 per cent presented an outspoken psychosis. It is to be remembered that most of these are still ambulatory patients; how many more may develop a psychosis before death cannot be determined. Thirty-five and two-tenths per cent show lesser mental changes, manifest even on casual observation. It may be added that these patients were all carefully studied from hematologic and serologic standpoints, gastric and stool examinations were made, and the cases passed on by experienced internists. Another criticism may be answered here with regard to bothriocephalus infections in Minnesota. While this intestinal parasite is relatively common in Minnesota as compared to its incidence in other states, actually it is rarely found, even by physicians practicing among the Finns in the northern part of the state. Even infected patients do not often present the typical blood picture of pernicious anemia, and free hydrochloric acid is often present on gastric analysis.

Barrett sums up the psychotic picture by saying that these patients have in common, irritability and suspiciousness, which forms the groundwork for delusions of persecution, the content of which is usually influenced by the somatoneurologic findings. He places this condition among the paranoid states which are symptomatic of a toxic process affecting the nervous system.

Bonhöffer considers cases of pernicious anemia with a psychosis indistinguishable from the infection psychosis. Putnam and Taylor emphasize the exaggeration of native traits. All four of Lurie's patients, and the patient recently reported by Darden and Hall, had delusions of persecution. The psychosis may for a time closely resemble dementia precox, dementia paralytica (Marcus, Camp), or Korsakow's psychosis (Bonhöffer, Barrett).

Why it is that some patients develop a psychosis while others do not, is a question hard to answer. It may be that constitutional factors play the deciding part; this was very evident in some of our cases, but by no means in all. Hereditary predisposition is stressed by Putnam and Taylor, Marcus, and Barrett. Bonhöffer believes these symptoms may occur in patients otherwise well and without hereditary taint. The care with which this point is inquired into, as well as an estimate of the same factors in patients who do not develop a psychosis, is, of course, of greatest importance. Too often this point is entirely overlooked in the nonpsychotic group, which results in a conclusion that is entirely distorted and erroneous. Patients who pass through mild

and transitory psychoses are not likely to enter a psychopathic hospital; those who develop the more severe and lasting psychoses, and who are in consequence hospitalized, may present an altogether different family history. From the study of our cases it would appear that patients having a poor endowment and who are inherently unstable develop psychoses more readily.

To be sure pernicious anemia may be expected to exert a modifying influence on the psychotic picture of patients suffering from an unrelated type of psychosis, such as manic-depressive insanity, just as syphilis may color the psychotic picture of a patient suffering from some other type of major psychosis.

It is usually said that the mental disturbances proceed pari passu with the intensity of the anemia. This may be true so far as mild confusional states go, but it does not invariably hold for cases in which the more marked mental disturbances are exhibited. Indeed, the same discrepancy seems to obtain here that has been noted with regard to the cord and peripheral nerve changes, which may fluctuate with entire independence of the degree of anemia.

The same lack of parallelism may exist in diabetes mellitus, as shown by Singer and Clark. Here, too, the psychotic picture closely resembled that seen in pernicious anemia.

Just what influence the pathologic changes have in the production of a psychosis cannot be determined with certainty. They, no doubt, contribute to its development, yet they may be found in patients who have not had mental disturbances.

Pernicious anemia is important as a cause of mental disturbances; pernicious anemia is more common than is generally believed; this disease often escapes detection unless a low threshold of suspicion regarding it has been developed. (Author's abstract.)

Breukink, H. Treatment of Certain Mental Affections. [Ned. Tijd. v. Gen., Vol. 68, March 1. J. A. M. A.]

Breukink explains his method, which differs from Breuer's and Freud's in important respects, and is peculiarly useful in differential diagnosis and prognosis. "When it is possible to hypnotize the patient, his affection is curable." He gives instances of degenerative psychoses which had long been mistaken for dementia precox, but which yielded to proper treatment. The injury from herding such cases with dementia precox is obvious.

Hermann, J. Histopathology of Dementia Praecox. [Zschr. f. d. ges. Neur. u. Psych., LXXXVI.]

Hermann presents a very valuable study of about 50 cases in which extensive brain alterations could be demonstrated. Extensive fatty degeneration and sclerosis of ganglion cells were found, still more marked foci of destruction and diffuse cellular loss which were evident to some

extent in Brodmann's 5th layer but for the greater part in the 3d layer. There were found also neuroglia foci in the medullary ridge such as Walter has described. The greater number of the changes lies in the cortex though many times changes were evident also in the deeper gray substance, found in one case in the globus pallidum, a case with marked catatonic symptoms. In a case with epileptiform attacks, death occurring in status, there was acute cell disease (Nissl) with typical neuroglia reaction and foci of atypical neuroglia cells (Alzheimer).

Alford, L. B. Dementia Precox, a Type of Hereditary Degeneration. [Journal Missouri State Medical Association, January, XXI, 1.]

Since pathological studies have been inconclusive and etiological studies of various sorts have brought forth no positive evidence, the best chance of knowing the pathological process at work in dementia precox is probably from analogy. By virtue of its peculiar nature, the onset without exciting influence, the chronic and progressive course and the absence of demonstrable etiology other than heredity, it resembles most the degenerative conditions that come from an innate weakness of certain structures. These are more numerous than is generally supposed; they are about 50 in number altogether, some which may be mentioned being progressive muscular atrophy and dystrophy, Friedreich's ataxia, Huntington's chorea, familial essential tremors, familial optic atrophy and otosclerosis. Each condition is entirely distinct from the other and has its peculiar set of affected structures. Structures seem to be affected in accordance with function rather than by virtue of anatomical relation. What occurs in the higher level types, where pathology is obscure must be assumed by comparison with those involving lower levels at which pathological changes are definite. Dementia precox is thus assumed to be one of the group of hereditary degenerations having its own set of structures which are affected by the degeneration. It should be studied in relation to other members of the group. Future investigation should concern various aspects of heredity. [Author's abstract.]

Dunlap, C. B. Dementia Praecox. [Am. Jl. Psych., Vol. 4, Jan.]

This is a careful study of brain changes on the basis of eight cases. Dementia precox is less a structural brain disease than pellagra or alcoholism according to Dunlap. In both of the latter conditions changes, if present in the brain, are not primary but are secondary, not so much to varying somatic conditions as to fairly specific somatic conditions. Dunlap's study strongly indicates that dementia precox is completely lacking in any fundamental or constant alteration of nerve cells, though it shows, at times, within the brain the presence of nerve cell changes secondary to those varying somatic states found in so-called normal control cases. Dunlap suggests that any nerve cell alterations that may be seen in dementia precox, might be termed a reaction of the

nerve cells to various, mostly unknown, somatic conditions (plus post-mortem and technical factors) such as operate in controls. Since these nerve cell reactions in dementia precox seem in no way specific and are not constant or uniform; since they do not differ materially in degree or in kind from changes in the cells of control cases, it is justifiable to believe that they are dependent on the same general causes that operate in the controls and not on any special conditions existent in dementia precox. In other words, the cell changes found do not seem related to dementia precox.

Targowla, R., and Badonnel, M. Kidney Function in Mental Disease. [Pr. Med., Sept. 8, 1923.]

The ureosecretory coefficient and the elimination of phenolsulphonephthalein is here studied in patients suffering from various psychoses. Impaired function of the kidneys was frequent, especially in states of confusion, mania and melancholia. Diuretics are without effect, but function becomes normal with amelioration of the mental state. Among twenty-two cases of paresis insufficiency of the kidneys was found in nineteen.

Lisser, Hans and Nixon, Chas. E. Mental Retardation and Ductless Gland Disease. [J. A. M. A., Vol. LXXXIV, Oct. 6.]

Cases of mental retardation in which outspoken ductless gland disorders could also be detected are here recorded. The mental retardation was definite in all, and the endocrine disturbances were likewise obvious. It is indicated by the authors that a glandular origin for the mental retardation must remain for the present an unproved theory. It is noted, however, that thyroid feeding definitely advances the intelligence of mentally defective subjects of congenital myxedema. When pituitary extracts of similar potency are available, comparable results may be achieved in mental defectives, the subjects of dyspituitarism. Since the proof of such a contention hinges on mental improvement by appropriate organotherapy, it is stated that considerable experience with pituitary preparations now available has resulted in suggestive and encouraging results in a few instances, but not sufficiently striking or consistent to prove the foregoing hypothesis at present.

Vivian, M. Morphine Habit. [Med. Press and Circ., Nov. 29, 1922.]

M. Vivian states that she has found emetine to be a valuable aid in the treatment of patients suffering from the morphine habit. Her plan is to reduce very gradually the dose of morphine to 0.06 gram (one grain) a day, several weeks being allowed for this reduction. The dose 0.06 gram a day is then reduced over a period of six to twelve months by five milligrams at a time until no morphia is taken. Emetine hydrochloride is given hypodermically from the first, 0.01 gram thrice daily for one or two months and then 0.01 gram twice a day until the

treatment is completed. The author quotes Paton as her authority for this treatment and refers to his statement that emetine is a specific for alcoholism and for some forms of neurasthenia associated with dyspepsia, irregular action of the bowel and feeling of fatigue.

Roasendi, G. Autophagia and Automutilations in Mental Disorders. [Policlinico, May 7, 1923.]

Three cases of automutilation in paresis are here recorded. One, a man, cut off a finger to suck the blood; another ligated the scrotum. A young woman during an epileptic equivalent sliced off a toe with a painful corn. The hemorrhage very nearly proved fatal, but the epilepsy seemed to be arrested thereafter.

Burt, C. Causal Factors of Juvenile Crime. [Br. Jl. of Med. Psych., Jan. 1923. J. A. M. A.]

Nearly 200 cases of juvenile delinquency, and, as a control series, 400 normal children have been investigated by Burt in parallel inquiries; and the various adverse conditions, discoverable in their family history, in their social environment, and in their physical, intellectual and temperamental status, have been ascertained and tabulated for each group. Delinquency in the young seems assignable, generally, to a wide variety, and, usually, to a plurality of converging factors; so that the juvenile criminal is far from constituting a homogeneous psychologic class. To attribute crime, in general, to either a predominantly hereditary or a predominantly environmental origin appears impossible; in one individual the former type of factor may be paramount; in another, the latter; while, with a large assortment of cases, both seem, on an average and in the long rum, to be of almost equal weight. Heredity appears to operate, not directly through the transmission of a criminal disposition as such, but rather indirectly, through such congenital conditions as dulness, deficiency, temperamental instability, or the excessive development of some single primitive instinct. Of environmental factors those centering in the moral character of the delinquent's home, and, most of all, in his personal relations with his parents, are of the greatest influence. Psychologic factors, whether due to heredity or to environment, are supreme both in number and strength over the rest. Emotional conditions are more significant than intellectual; while complexes provide everywhere a ready mechanism for the direction of overpowering instincts and of repressed emotionality into open acts of crime.

Book Reviews

Barbour, D. N. Psycho-analysis and Everyman. [Geo. Allen & Unwin, Ltd., London.]

That there is psychoanalysis and psychoanalysis, everyone with a grain of sense should know. The name and the thing should not be confused. The Atlantic City boardwalk fakir who uses the term on his billboard deals as little with the real article as quacks do with any real aspect of medicine, but such is the magic of words that even the supposedly intelligent fail to distinguish between this type and the kindred echoes found in such magazines as Occult Science, Psychology, etc.

When a popular exposé really seems to get an idea of the outlines of the psychoanalytic principles we welcome it, and this book does in our opinion present a clear and explicit account of some of the current ideas which have been developed by psychopathology in this field.

The author puts in some of his own ideas in his exposition and here and there alters the technical terms, but apart from questions of exact logic these interpolations do not interfere with the fact that this is a fairly readable and comparatively accurate account of the general conceptions of psychoanalysis. It is particularly interesting as it applies the principles to everybody, not to that fictional non-existent person only, "the abnormal."

Ward, Stephen. Ethics. An Historical Introduction. [Oxford University Press, London.]

In the author's Preface we read that "philosophers know nothing," for after all "philosophy is largely a wrangle." We are disposed to agree with him and thus all the more pleasantly turn to his historical résumé of what different times, as precipitated by different philosophers, have thought about what in general is meant by ethics. Here is certainly a charming primer from which no one can turn after reading it without the sense that they have gained something very real and valuable.

Dewey, John. Experience and Nature. [Open Court Publishing Co., Chicago.]

Dr. Paul Carus of Chicago was a striking figure in the intellectual circles of that city especially in its formative stages. After his death his family established a Paul Carus Lecture memorial. This present volume, by Professor Dewey of Columbia, is the first fruit of this lectureship.

In all respects it is a happy choice, for the present volume sets a standard of the most superior character. Dr. Dewey's lectures are delightful; no amount of characterization in a book review can convey their many-sided, interesting, and humanistic qualities.

The title alone shows just what to expect. Human experience in its contact with nature is most charmingly portrayed, and through it all runs a vein of healthy, sturdy contact with reality rather than a pedagogic effort to encompass the universe. We feel our readers will profit greatly in their reading of this set of lectures.

Grosz, Karl. Klinische und Liquourdiagnostik der Rückenmarkstumoren. [Julius Springer, Wien. Mks. 7.]

The author is an assistant in Wagner v. Jauregg's clinic in Vienna and the clinical material here analyzed was personally observed here or in v. Eiselberg's surgical clinic, and checked up either by operation or by autopsy.

It is thus a clinical document of great value and as such will prove of great service to neurologist and surgeon interested in spinal cord tumors. The case histories are given in full and hence no abstract is possible. The book should be possessed and read.

Carus, C. Gustav. Symbolik der menschlichen Gestalt. Neu bearbeitet und erweitert von Theodor Lessing, Dritte Auflage. [Niels Kampmann Verlag, Celle.]

This is a curious book. Carus, the author, was born in 1789 and died at the age of eighty. He was professor of comparative anatomy and morphology in Dresden and wrote many interesting and unique philosophical and natural history studies which belonged in general to the Goethe period and which to the present day contain many fascinating features which modern students of constitution could study to advantage.

The book is so well known as to need no extended discussion, but the present new edition has added materially to many of its features and rendered it even more interesting. In case one should care to get an idea of what it is about, it deals chiefly with form relationships, mathematically considered between the human organism, its parts, and all the rest of the universe. It is full of ingenious notions.

Liertz, Rh. Ludwig II. König von Bayern. [Frankes Buchhandlung, Habelschwerdt 1 Schlef.]

Much has been written of the tragedies of the Bavarian house of the Wittelsbachs, and the special tragedy of this monarch who took to his death the gifted neuroanatomist and psychiater, v. Gudden, has been the subject of much discussion and brought about the use of printers' ink galore.

Dr. Liertz does not here attempt a life history of Ludwig II, nor even a complete discussion of his psychotic evolution. He limits

himself to a discussion of his ego evolution and to the development of his delusional system.

This intriguing story is written from the psychoanalytic standpoint and interestingly enough the author is a good churchman of Rome and has written psychoanalytic works stamped by official sanction from this holy city, evidence possibly that the European church in this respect is a little more enlightened than some not so centrally located. One of his works upon psychoanalysis has reached a fifth edition (13–16 thousand), a record not reached by any with which we are acquainted.

What strikes us most in this work is its sympathy with human nature rather than its formal psychiatric character. It is a very readable work and throws much light upon the man so much beloved by many in spite of his illness.

Bruck, Carl. EXPERIMENTELLE TELEPATHIE. [Julius Püttmann, Stuttgart.]

In a brochure of 100 pages with 83 text pictures and 24 plates there is here presented what is entitled "some new investigations concerning telepathic reproduction of drawings." There is an introductory chapter by Mrs. E. M. Sidgwick, vice-president of the English Society for Psychical Research, and Dr. Arthur Kronfeld of Berlin.

The procedure is an old one. The medium or what not is hypnotized. A picture is observed very intensively by Dr .Bruck in an adjoining room and then wrapped up. The medium is then taken into the room and under suggestion is told to reproduce the picture. The results are here partly placed in evidence.

Kronfeld assures the reader of the honesty of the entire procedure and gives a very instructive discussion of the possible significance of the phenomena in which he quite nicely emphasizes the "ubiquity of the occult." What can anyone really explain about anything; one may think we understand much but at bottom all life is a mystery and rationalization is but a special case of seeking security in the face of the unknowable. The book itself is a much more interesting document than most of its kind.

Pfeifer, Richard Arwed. MYELOGENETISCH-ANATOMISCHE UNTERSUCHUNGEN UEBER DEN ZENTRALEN ABSCHNITT DER SEHLEITUNG. [Julius Springer, Berlin.]

We have had occasion to call attention to previous studies of Pfeifer upon the cortical representation of the optic tracts. He has here gathered them together, rewritten and rearranged the material, and given us an up-to-date, thoroughly scholarly, and impressive monograph. As a pupil of Flechsig's, he has carried the myelogenetic method to its best advantages.

He believes he has something new to say. One can read with great interest his discussion of the work of his predecessors upon the optic tracts, von Monakow, Henschen, Niessl, v. Mayendorf, Brouwer, Adolf Meyer, and others, and gain a clear picture of the development

of our present day knowledge of certain parts of the central optic pathways.

The author's own investigations drawn from the rich collections of Flechsig are then given in great detail and are beautifully illustrated.

As an anatomical study, and as a justification of the value of the myelogenetic method, it is of great value, and constitutes a contribution to the analysis of the optic pathways of distinct service to neurological science.

Baerwald, R. Zeitschrift für Kritischen Okkultismus und Grenzfragen des Seelenlebens. Vol. I, Heft 1. [Ferdinand Enke, Stuttgart.]

This is a new periodical to be devoted to a critical study of so-called occult phenomena, metapsychic, as Richet would call them, and to borderland problems of the soul. It will appear quarterly in fascicles of 80 pages each, and the volume of 320 pages will cost $5.

The present initial volume contains much interesting matter. Among its contributions there is to be found some amusing material about Houdini's claims and a large amount of space devoted to Coué.

Riley, Woodbridge; Peabody, Frederick W., and Humiston, Charles E. The Faith, the Falsity and the Failure of Christian Science. [Fleming H. Revell Company, New York, etc.]

We forbear making any extensive review of this timely book, knowing how difficult it is to force evolution and that morons are not alterable by anything but the invincible laws of survival of the fittest. We therefore simply mention this volume as one of value for those who are of an inquiring turn of mind and care to learn thereby of this special form of dementia precox parading as a religion. One important point, however, has been missed by the authors. In the last words of the work we find a statement that robbers demand your money *or* your life. Science puts it, your money *and* your life. Unfortunately, this is not the only healing pretension built along similar lines. Christian Science never would have arisen if the regular medical profession had known more of psychopathology.

Kleist, Karl. Die gegenwärtigen Strömungen in der Psychiatrie. [Verlag von Walter de Gruyter & Co., Berlin and Leipzig.]

This is a reprint of some forty pages which most admirably presents the movement in psychiatry of the past twenty-five years. Kleist first gives a rapid summary of the evolution of psychiatry in the past century and then considers the developments of the present day. He develops four trends which show themselves most strikingly—the philosophical, the psychological, the neurological, and the constitutional. The first seemed to spring from a discouragement that arose out of the difficulties of clinical psychiatry in its possible

overemphasis upon the "einheit" of the "krankheitsbild," first arising through the work of Hecker, Kahlbaum, and Magnan, and carried into prominence by Kraepelin. The ideas of Bergson, Driesch, Jaspers, Husserl, and others have afforded a certain support to this movement, which can be seen most saliently in the work of Schneider, Kronfeld, and Hildebrandt. In the psychological direction one encounters some of the previously mentioned workers, and more particularly those allied to the psychoanalytic movement. The neurological method, which had its chief stimulus from Meynert, Griesinger, and Wernicke, is represented widely in the work of Kleist himself, the Vogts, Pick, and the syndromy "lehre" of much present day psychiatry, and finally in the constitutional trend one encounters the work of the geneticist, Rüdin, especially Kretschmer and related workers.

This is a very instructive little pamphlet, and coming from so acute a worker as Kleist is entitled to serious consideration.

Jacobi, Mary Putnam. A PATHFINDER IN MEDICINE. With Selections from her Writings. Edited by the Women's Medical Association. [G. P. Putnam's Sons, New York and London.]

Here is a work that defies reviewing. It is a review in itself—a review of a life of unusual interest and one that stands out in the annals of biography as unique and worthy of the highest praise.

In the Foreword we read the purpose of this book:

"The Women's Medical Association of New York City desires to perpetuate the memory of the work done by one of its founders, one of the great pioneer women in medicine. She opened the doors of a great university that women might equally with men obtain a scientific medical education. All her life she was a zealous worker for this advancement of the medical education of women. To continue this, her work, the Association has founded the Mary Putnam Jacobi Memorial Fellowship, thus far awarded four times, to increase the medical knowledge of the recipients. The Association in this volume has collected some of her medical writings, illustrating her studies on the medical problems of her day. With her writings as with her other medical work, 'she was never satisfied. There was always a better than her best, a higher than her highest to be striven for; and in this striving she was not influenced by personal ambition, but by the higher object—the truth to be attained.'"

And it is not without interest that George Haven Putnam, a nephew, should say—for it is all true what he says:

"Here is the story of a rare American woman—a pioneer scientist, a fine citizen, an admirable mother. Her life is a romance of accomplishment and an inspiration to the women of to-day for whom she blazed the trail of feminine independence. The book is a cross-section of the finest sort of unusual American life and a biographical contribution of real historic value and far-reaching interest."

For many years the reviewer knew and admired this courageous and gifted woman not only in her professional capacity but in her

home and family life. She did not shine in the reflected glory of her illustrious husband; she was a personality as well as he.

Lipschütz, Alexander. The Internal Secretions of the Sex Glands. [Williams & Wilkins Company, Baltimore.]

We have commented most favorably upon this important monograph elsewhere when it appeared in its original German edition. The medical profession is to be congratulated upon this most excellent English version with its short but interesting preface by Marshall of Cambridge.

Lipschütz's work is one of the most fundamental of those which have appeared in the field of gonadal endocrinology and is cordially recommended.

Bloch, Iwan, and Loewenstein, Georg. Die Prostitution. Zweite Band. Erste Haelfte. [Louis Marcus Verlagsbuchhandlung, Berlin.]

The senior author of this work, who died but a few years ago (1922) at the early age of fifty, was internationally known as one of the most alert minds dealing with the problem concerned in the direct forms of sexual behavior in mankind. His contributions have been numerous and marked by great literary merit as well as careful observation.

The first volume of this great work on prostitution appeared in 1912 and was reviewed in this Journal. The present continuation was interrupted by the Great War and then later by his illness and death but fortunately carried through to a finish by Loewenstein.

This has been done in a highly meritorious manner and beginning with Chapter IX takes up The First Occurrence of Syphilis and its Significance for Prostitution. As is well known, Bloch wrote an interesting and widely documented work upon the origin of syphilis, the chief conclusion of which was its Central and South American endemicity, chiefly in some of its lower animals, the llama classically, whence through bestiality it was communicated to man and then brought to Europe by the soldiers and sailors of Columbus. He here goes over further evidence, discusses the objections raised and then deals with the increasing taboo upon prostitution due to its dangers and their relation to the development of sexual ethics.

Prostitution during the Renaissance, the Reform and Antireform period (16–17 A.D.), covers three or more chapters. Chapter II is especially informing regarding the courtesan of that period. Those feminists who regard free-love as modern can read with profit this chapter as to this aspect of sexual morality. The tenth and eleventh chapters deal with the usual types, the twelfth with the locals and variant types. Thus we can read of the famous "houses" of these centuries in most of the large cities of Europe. Bloch has collected an enormous mass of information from the greatest variety of sources. Chapter XIII deals with the efforts at suppression. The reformer of to-day can read of these century-old efforts and learn not what to do. Other chapters deal with the literary and artistic

portrayals, prostitution at the present time, variations in the form of prostitution, moral and ethical relationships and the final chapter upon the efforts at state and communal regulation. A very complete index finishes this most scholarly presentation of a situation for the most vital part most hypocritically dealt with by Anglo-Saxons.

Bernfeld, Siegfried. Sisyphos oder die Grenzen der Erziehung. [Int. Psycho. Verlag, Vienna.]

Had the results of Bernfeld's certainly clever considerations been more favorable he would never have chosen this title for a discussion of education. This is a spirited and ingenious causerie on method and organization in education. The psychology of the same grows out of the psychoanalytic principles of the psychology of the baby and the child. As a result he distinguishes between education (upbringing) and pedagogy and leads the failures of the former back to contaminations with the latter. Bernfeld is firmly opposed to those who believe (with Melanie Klein, for example) that psychoanalysis can be carried out effectually with the child, but he draws many analytic postulates from objective studies.

O'Brien-Moore, Ainsworth. Madness in Ancient Literature. [R. Wagner Sohn, Weimar.]

This is a Ph.D. thesis of Princeton University and although containing more Greek than psychiatry it is a very remarkable production. It has so much Greek that no one can really read it save perhaps a few enthusiasts who have kept up this ancient and honorable tongue. The author shows himself to be thoroughly conversant with the literature of the ancient Greeks and has utilized every reference to point out the representations of madness in the tragic and comic productions of the period. He shows in a scholarly manner how the poet and dramatist of that day kept in touch with social, legal and medical thought and lead his own method of reading into the problems of life, of which madness was an outstanding faulty solution.

As to-day so then the word mad had many connotations but he brings into relief certain interesting psychotic pictures, notably one Dionysius of Syracuse who showed a typical paranoid evolution. The broader character anomalies which to-day are frequently designated mad—crazy—nutty were used in those days much as now, but the clearer cut situations of hysteria, fixed ideas, and psychoses, the author states, were unknown to antiquity. We do not assent to this, even for the dramatists, else we have misread the Mad Hercules and Oedipus Rex.

But this apart, the thesis is an admirable one and our greatest lament is that the great amount of knowledge of Greek necessary has hampered our understanding but not diminished our enthusiasm.

Gerstmann, J. Die Malariabehandlung der progressiven Paralyse. [Julius Springer, Vienna, 1925.]

In Vol. 55, 1922, of the Journal of Nervous and Mental Disease there appeared the first discussion in English by Wagner-

Jauregg of the malaria method developed by him for the treatment of general paralysis. Gerstmann has been Wagner's constant assistant in this work and presents in this volume a thorough summary of its development in Vienna and its steadily increasing practice in other countries. Gerstmann recapitulates the historical forerunners of the malaria treatment, for a summary of which we refer to the aforementioned number of this journal. The greatest space is given to a systematic discussion of the technic, pathology, and clinic of the treatment, a presentation which makes the volume a valuable handbook for the practice of this method.

It must be remembered that the inoculation malaria does not increase itself by means of intermediate stages, a circumstance which has proven to be of invaluable importance for its widespread use. Nosologically the inoculation type differs from a natural tertian malaria in its atypical fever periods, originating in atypical developmental stages of the schizonts, its surprising lack of organ changes or swellings, but most particularly in its thoroughly noninfectious character and its great susceptibility to quinine even in small doses. These latter characteristics are not only clinically but experimentally verified in a special section. The noninfectiousness of the artificial type is due to a paucity of gamete forms in the blood, with the result that once effected anopheles stings do not lead in that host to sporozont forms.

Although the Viennese clinic has treated far over 1,000 cases to date, Gerstmann refers only to 400 of those cases which have been treated two or more years ago. After a comprehensive survey of his material a carefully sifted remainder of about 39 per cent cured is left, whereby the criterion of the cure is the ability to return to society and to work. Naturally the patient is not released until the psychic and somatic symptoms have first largely disappeared. In addition to his own material Gerstmann surveys the reports of other clinics, particularly those of the Hamburg and other German clinics where the treatment has been in widespread use. The favorable results from Hamburg run to over 50 per cent, from Frankfort to over 47 per cent but it must be remembered that none of the clinics chose their material. Altogether the results amassed by the Viennese and the German clinics are convincingly thorough and impressive.

The steady control of the liquor, serum and blood findings before and long after treatment has led to the conclusion that these findings bear no definite relation to the satisfactory results achieved. In one case the findings were universally positive although the patient had been in a responsible social and economic position for 7½ years after treatment. Gerstmann also reviews the pathological reports of the clinic to show that malaria not only rids the nervous substance of every trace of spirochetes, but that the infiltrations typical for general paresis are transformed first into an acute plasma cell inflammation and then into a regressive type of fibrous meningitis with only minimal signs of infiltration in the nervous tissue. The question as to the effective principle by which artificial malaria factually cures a disease long held to be incurable remains puzzling despite the

several theoretic serologic considerations put forward by German neurologists. Perhaps this question may be answered by the studies with malaria in the treatment of other forms of syphilitic lesions, a field already well spaded for further sowing by Kyrle's favorable reports on over 500 patients from the Vienna skin clinics. (The very recent decease of this productive clinician early in his forties is greatly to be regretted.) Despite Wagner-Jauregg's and Gerstmann's statements to the contrary, it remains for deeper experimental study to show that the fever per se does not bring about the changes recorded. That is still the most tangible assumption especially in connection with some characteristic immunizing process.

It is not without interest to reflect that two classmates of the Vienna medical faculty have produced such widely divergent and ingenious therapeutic measures in neuropsychiatry as Wagner-Jauregg and Freud.

Krabbe, Knud. Les Maladies des Glandes Endocrines. [Libraire Le Francois, Paris.]

What between the endocrines, pollen extracts and psychoanalysis the present day physician is in a sorry pickle. But as to the first of these, which has been as much exploited as the rest, in season and out of season from Black Oxen through the entire range of cure alls, occasionally we find a nugget of real value. This little book of Dr. Krabbe's is one of these.

It originally appeared as a chapter in the Scandinavian System of Medicine which has been reviewed in these pages. It is now available in a language which is more accessible and as such deserves a wide reading. The author occupies a mid position between the skeptic attitude of Swale Vincent and the optimistic touting of some of the writers for the commercial manufacturers of these cure alls. We still think the chapter upon the Endocrinopathies in Jelliffe and White's 4th Edition of Diseases of the Nervous System about the best balanced discussion in this difficult field of medicine compressed though it is.

Roback, A. A., et al. Problems of Personality. Studies Presented to Dr. Morton Prince, Pioneer in American Psychopathology. Edited by Drs. C. MacFie Campbell, H. D. Langfeld, William McDougall, A. A. Roback, and E. W. Taylor. [Harcourt, Brace and Company, New York.]

The European custom of Festschrift preparation has not found much following in the United States. This is to be regretted since it is a type of appraisal of much intrinsic significance.

Therefore we welcome this volume which is a volume of this type done in honor of Dr. Morton Prince, who in the quarter century following the death of Beard has carried the torch of psychopathology both valiantly and almost alone.

The collection of studies is a large and a singularly meritorious one. From the opening words of G. Elliott Smith on the Evolution of Intelligence and the Thraldom of Catch-Phrases to the bibliog-

raphy one has almost a Lucullian banquet of good thnigs to read and ponder over. Among the authors we find E. Jones, W. A. White, E. Claparède, G. M. Stratton, C. MacFie Campbell, A. A. Roback, P. Janet, C. K. Mills, E. W. Taylor, T. W. Mitchell, C. L. Dana, J. R. Hunt, B. Hart, K. Dunlap, C. S. Myers, W. McDougall, C. J. Jung, William Brown, H. H. Goddard, S. E. Jelliffe, J. T. MacCurdy, S. Langfeld, L. H. Horton. As for the titles of the papers these must be left to the reader of the book itself. It will well repay his effort.

It may be mentioned that the book belongs to that interesting collection, the International Library of Psychology, Philosophy and Scientific Method.

White, William A. Essays in Psychopathology. Nervous and Mental Disease Monograph Series No. 3. [Nervous and Mental Disease Publishing Co., New York and Washington. $2.50.]

These essays, all essentially modern in their outlook, direct and straightforward in their statement and delightful in their style of presentation, support a present-day platform in Psychopathology which is of great importance.

While this volume makes no claim to systematic presentation perhaps it is thereby all the more effective, for in spite of such an effort at continuity the advance of the general theses is all the more conclusive by its restatement from various angles.

We know of no more attractive and at the same time useful collection of papers than these here presented.

Turpin, R. A. La Tétanie Infantile. [Masson et Cie, Paris. 16 fr.]

Judging from a rapid survey of the literature of pediatrics as revealed in the pages of the Index Medicus the problems connected with infantile tetany are of very great practical importance. It is not an insignificant chapter.

This small monograph then will come as a welcome addition to this scattered literature, summarizing as it does the many studies referred to and contributing some definite clinical and experimental observations.

The entire problem is reviewed from the clinical and chemical points of view with special emphasis laid upon the biochemical studies of the blood, and, especially, as a departure from the older issues, the author stresses the value of Lapique Bourguignon's work on chronaxia as a great advance in the electrical investigation.

The work of MacCallum upon the primary importance of the calcium metabolism disturbances is essentially advanced by the newer biochemical blood researches upon acid-base equilibrium, and thus more explicit light is shed upon the therapeutic possibilities and their more accurate application.

Obituary

EMIL KRAEPELIN

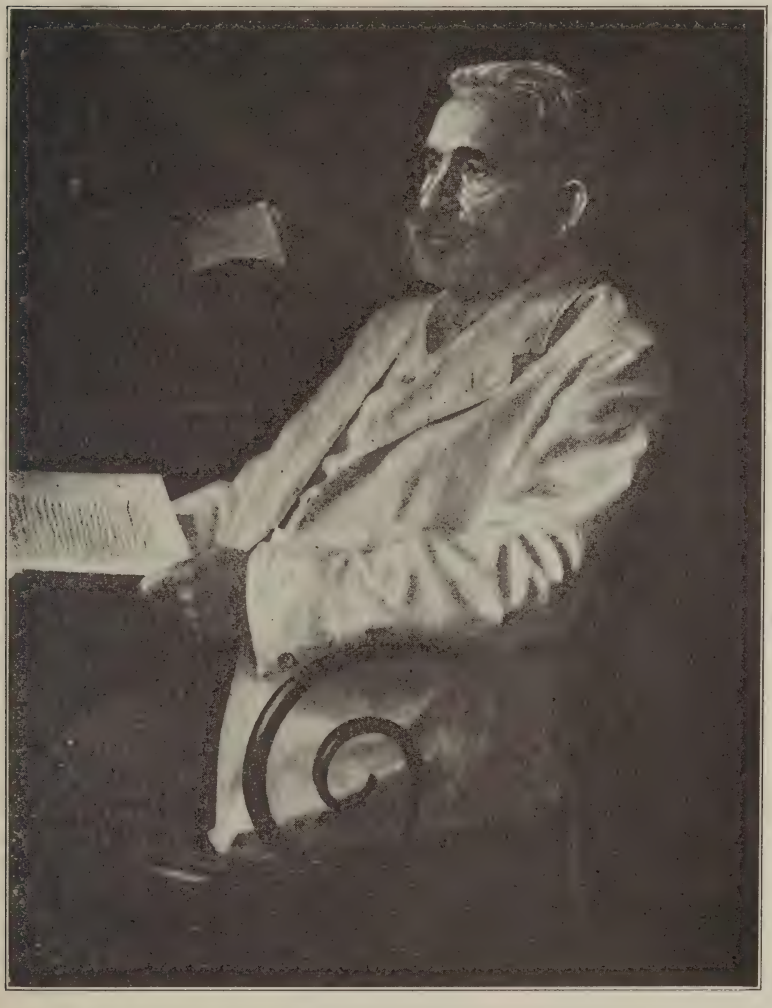
The death of Emil Kraepelin at Munich, October 7, 1926, is an event which touches the entire world of scientific and social progress. He was more than an eminent psychiatrist. A broad humanitarian interest directed his attention to problems of mental welfare in every form and guided his spirit of indefatigable research to very practical results.

His name is associated throughout the world with two marked achievements in the advance of psychiatry, both of which enlisted his activity to the time of his death. The first of these is the publication of the fruit of his labors in his textbook of psychiatry, which has appeared in eight editions in his own and other languages. It embodies the principle of the classification of mental diseases, with which he brought order into the vagueness and confusion in which the older psychiatry groped. The most conspicuous service rendered here was Kraepelin's grouping of the "cyclic insanities," including those that were merely recurrent, under the term "manic-depressive insanity," with the addition later of simple mania and most melancholias. This classification has paved the way for further distinction and regrouping, represented chiefly in the manic-depressive and the schizophrenic group. Recent psychiatry has proceeded further, and in some schools differently, to determine the underlying psychological background of the personality in which disorders of these types are manifest. There has been effort to consider more fundamentally a functional situation involving emotional failures of adaptation upon a basis of predisposing tendencies rather than to accept an established constitutional disease.

These differences which have arisen in the course of psychiatric progress do not however mark the decline of Kraepelin's service to his profession. Despite his seventy years, his mind was still actively engaged upon these matters, and almost to the moment of his death he was occupied in the preparation of the ninth edition of his textbook. With a mind alert to the movements of the day and an energy devoted to further research, he has doubtless provided in this just-

completed work fresh stimulus for the review of these important questions.

The other great enterprise of Kraepelin's life was the founding and furtherance of the Deutsche Forschungsanstalt für Psychiatrie at



Emil Kraepelin

Munich, later incorporated into the Kaiser Wilhelm Institut. A recent appropriation from the Rockefeller Foundation brings promise of the realization of Kraepelin's dream that a proper home should be

built for the important work of this institution. The final fulfillment of this dream also engaged his activities to the last.

Another project was in preparation, a journey to India and Ceylon for the purpose of investigating the effect of racial characteristics upon psychic morbidity and the forms which mental diseases take among different peoples. This journey of research was to have been a continuation of the work which brought Kraepelin to America last year to study negroes and Indians. Both of these undertakings were preceded twenty years ago by a trip of a similar scientific nature among the inhabitants of Java. The spirit of the self-forgetting investigator is manifest in the urgent request that this plan would still be carried out, although its originator had finally to yield to inevitably approaching death.

Kraepelin, from his student days, which were spent under Wundt of Leipzig as well as Gudden of Munich, was deeply interested in psychology. He believed in the close relation of normal psychology to that of the mentally diseased, and believed that the one would throw light upon the other. This broader interest opened his mind to the larger relations of specific problems. It led him, as early as 1900, to advocate a criminal psychology and to lift the question of punishment from the plane of mere retribution to purposive action of benefit to society and to the criminal.

He was active also in advocating attention to the mental as well as physical welfare of school children. He was an ardent opponent of alcohol. His publications include writings upon these matters of social welfare and also specific studies of disease problems in addition to his well-known psychiatric textbook.

Kraepelin's professional associations have been for the greater part of his life with the University of Munich. His student days were passed as Würzburg, Leipzig and Munich. On graduation in 1878, he worked clinically in Leipzig and Munich. He entered into the faculty of the University of Dorpat in 1886, passing on to Heidelberg in 1890. He went to Munich in 1903 and although his retirement from the university was necessary because of an age limit, he continued his work of investigation in the institute for research which he had founded.

N. B.—All business communications should be made to Journal of Nervous and Mental Disease, 64 West 56th St., New York.

All editorial communications should be made to Dr. Smith Ely Jelliffe, Managing Editor, 64 West 56th St., New York.

Vol. 65 FEBRUARY, 1927 No. 2

The Journal

OF

Nervous and Mental Disease

An American Journal of Neuropsychiatry, Founded in 1874

Original Articles

THE RELATION OF THE CEREBELLUM WEIGHT TO THE TOTAL BRAINWEIGHT IN HUMAN RACES AND IN SOME ANIMALS *

By C. U. Ariëns Kappers

of Amsterdam, Holland

In the following pages I shall give some figures concerning the total brainweight and the cerebellum weight in the Dutch, Chinese and Japanese, adding some figures concerning the same relation in animals.

I have been induced to this work amongst other things by the fact that Topinard[1] seems to consider the relation of the cerebellum weight to the total brainweight (T.B.W.) of some value for anthropological studies and, on account of the weighings of Clapham,[2] thinks himself justified to the conclusion that the relative cerebellum weight in the Chinese is less than in Europeans.

Another motive to examine this relation is that—in connection with the somewhat different character of the Mongolian brain compared with that of the average Dutch brain—it seemed not impossible that the cerebellum in the Chinese might be different in its weight relation to the total brain from the average Dutch.

Before entering upon the results of my researches, I will briefly review the literature on the relative cerebellum weight in adult man.[3]

* Communicated at the meeting of the Royal Academy of Science, Amsterdam, Proceed. 29, No. 1.

[1] Topinard. Eléments d'Anthropologie générale. Paris, 1885, page 578. "Chez les hommes la plus forte proportion de cerveau se rencontre chez les Chinois et les Caroliniens de M. Clapham et inversement la moindre proportion de cervelet et de moëlle allongée réunis."

[2] Crochley Clapham. The brain weight of some Chinese and Pelew Islanders. Journal of the Anthropological Institute of Great Britain and Ireland. Vol. VII, 1878, page 89.

[3] I shall not discuss here the interesting results of Pfister on the relative cerebellum weight in children (Das Hirngewicht im Kindesalter, Arch. f. Kinderheilkunde Bnd. 23, 1897, page 164).

Krause,[4] examining this subject in Germans, stated the average cerebellum weight percentage in men to be 1/9 or 11.1%, in women 1/8 or 12½%, giving an average absolute figure of 128 gr.

Parchappe[5] on the contrary (in the French) found a larger cerebellum percentage in men (11.8%) than in women (10.8%) and gives the former an average absolute cerebellum weight of 160 gr., with an average T.B.W.=1352 gr., in women an average absolute cerebellum weight of 133 gr., with an average T.B.W.=1229 gr.

Somewhat lower figures are mentioned by Huschke[6]: in men between 10 and 80 years he found 10.95%, in women of the same age 10.69%, so in the average 10.82%.

Figures similar to those of Parchappe were found by Boyd[7] (♂ 11.9% and ♀ 11.44%) on account of 2,500 cases in St. Marylebone's Infirmary and the Somerset County Asylum.

Meynert[8] on the contrary found in men 10.5% only, in women 10.6%.

Crichton Browne,[9] examining 400 postmortems at the West Riding Asylum, again gave a higher average: 11.33%.

The latest statistics concerning this matter are composed by Rey, on account of the figures, registered by Broca in 273 men and 137 women.

Rey[10] found the average to be in men 10.66%, in women 11.03%, consequently a total average of 10.84%.

The most important weighings for my subject are those published by Weisbach[11] for the different nations of the former Austro-Hungarian monarchy, belonging with those of Boyd and Rey to the most useful ones covering the largest material, and—in contrary to those of Boyd and Rey (Broca)—concerning mostly neurologically normal people. Weisbach's figures are also important for my purpose, since they include the Magyars, a race being largely Mongolian.

[4] Krause. Handbuch der menschlichen Anatomie. Cited here after the third edition 1879. Vol. 11, page 763.

[5] Parchappe. Recherches sur l'Encéphale, sa structure, ses fonctions. Ière Mémoire, Paris, 1836, page 99.

[6] Huschke. Schädel, Hirn und Seele der Menschen und der Tiere nach Alter, Geschlecht und Raçe. Mauke, Jena, 1854, page 75.

[7] Boyd. Tables of weight of the human body and internal organs, etc., arranged from postmortem examinations. Philos. Transactions of the Royal Society of London, B. Vol. 151, 1861. I calculated these percentage figures, given by Boyd on page 262.

[8] Meynert. Das Gesamtgewicht und die Teilgewichte des Gehirns. Vierteljahrsschrift für Psychiatrie, 1867. Bnd. 1. Quoted after Ziehen; I could not obtain the original.

[9] Crichton Browne. On the weight of the brain and its component parts, in the insane. Brain, Vol. I, 1879.

[10] Rey. Les poids du cervelet, du bulbe, de la protuberance et des hémisphères d'après les régistres de Broca. Revue d'Anthropologie, 2ième serie, Tome VII, 1884, page 193.

[11] Weisbach. Gewichtsverhältnisse der Gehirne Oesterreichischer Völker. Archiv für Anthropologie, I, 1867.

Weisbach then found in the different populations of the former Austro-Hungarian monarchy the following relations:

Nations	Number examined brains	Aver. T.B.W.	Aver. weight Cerebell.	Aver. per cent Cerebell.
Magyars	46	1322.86	139.74	10.56
Roumanians	13	1326.58	142.83	10.76
Italians	40	1301.37	139.82	10.74
Poles	11	1320.59	140.08	10.60
Ruthenians	18	1320.63	141.55	10.71
Slovakians	11	1310.74	142.56	10.87
Czechs	25	1368.31	146.28	10.69
South-Sclavonians	8	1305.14	139.56	10.69
Sclavonian women	14	1174.95	129.60	11.03
Germans	46	1314.50	142.20	10.81
German women	16	1180.15	125.56	10.63

In this table the Magyars have the smallest relative cerebellum weight, a fact I shall return to later (see page 118).

Moreover Weisbach observes that he found great individual differences in the relative cerebellum weight, even with approximatively equal total brain weights.

According to him these differences may be explained only partly by regressive alterations of the different brain parts with age (in Germans in men the cerebellum diminishing relatively more than the cerebrum, while in women the cerebrum should exhibit more regressive changes in old age, according to him).

I need not say that the number of women, examined by Weisbach is too small to justify this conclusion as a constant fact.

On account of one male cerebrum of 91 years and two female ones of 92 and 93 years Topinard concluded inversively (l. c. p. 579). My own figures show the value of such conclusions, as I registered a man seventy-six years old showing a cerebellum percentage of 10.62 followed by another, seventy-six years old, with a percentage of 8.98, followed again by a man, eighty-seven years old, with a cerebellum percentage of 12.12%. Amongst the women I have one seventy-six years old, with a cerebellum percentage of 11.24 and another, eighty years old, with 9.72% cerebellum. We ought to view these cases individually without generalizing. In this matter I absolutely agree with Rey, saying "les poids absolus et les poids relatifs du cervelet, du bulbe, de la protubérance et des hemisphères présentent de continuelles oscillations où il est difficile, sinon impossible de saisir l'influence de l'âge."

Moreover Weisbach (l.c. p. 316) supposes the height of the body to influence the cerebellum more than the cerebrum. Generally in larger men he found the cerebellum weight to be relatively larger.

My own matrial of human brains being too small, and containing

too few cases, in which the body length[12] was noted, I was unable to verify this on human material.

On account, however, of my weighings of animal cerebella I shall return to the influence of the stature.

Clapham's figures on the Chinese are useful for our comparison with a correction only (see below) since this author did not weigh the severed cerebellum, but the cerebellum connected with the pons and medulla oblongata (in 16 cases).

Owing to the above it is interesting to know the figures, found by myself in 7 Northern-Chinese, 15 Chinese from the Dutch East-Indies, totally 22 Chinese cerebra and in 8 Japanese brains.

Thanks to Professor Deelman, Dr. Dijkstra and Dr. Hammer I have been able to compare these figures with those found in 25 Dutch brains (13 from Groningen and 12 from Amsterdam W.G.).

I must emphasize that all weighings were done by myself and following the same method, viz., without pia and the ventricles being emptied. Since Harvey[13] determined the average total volume of the ventricles to be 30.4 cm.^{2}, the cerebral fluid would amount to a weight of about 30.6 gr. Besides, this author found the largest brains to have the smallest ventricles, the smallest brains having the largest ventricles, the fluid increasing the T.B.W. in an inverse way.

The cerebellum was severed immediately above the emergence of the VII and VIII roots.

My results in the Dutch are recorded in the two following tables:

MEN

Origin	Further indication	T.B.W. *Gr.*	Weight Cerebell.	Per cent Cer.	Age *Years*	Height *CM.*	Causa mortis
W.G.	15256	1452	171.5	11.81	9	?	trauma
"	15283	1680	156	9.28	16	176	"
Gron.	Gor.	1470	164	11.15	17	165	empyem. pneum.
"	Boe	1360½	117.5	8.63	18	178	peritonitis
W.G.	15297	1299	137	10.54	26	170	t. b. c.
Gron.	Gro.	1375	128	9.30	42	160	ca. ventr.
"	Verh.	1224	136	11.11	45	170	ileus (perit.)
"	de H.	1401	143.5	10.24	62	181	carc. prostat.
"	Siem.	1102	115	10.43	74	168	nephr. chron.
"	Hoog.	1054	114	10.81	74	165	carc. oesoph.
W.G.	15263	1365	145	10.62	75	170	carc. recti.
"	15243	1124	101	8.98	78	163	carc. linguae
"	15271	1278½	155	12.12	87	155	?
Average		1322	137.2	10.378			

[12] In the average the stature of the Chinese (especially of the Northern-Chinese) is not smaller than that of the Dutch. The Japanese only might be useful in this respect. My number (8) being so small, I hesitate to make a positive conclusion. Still the figures found here do not contradict Weisbach.

[13] Harvey. The volume of the ventricles of the brain. Anat. Record, Vol. V, 1911, page 304.

Hence we see that I found the average cerebellum weight in the men to be 10.378 per cent, in women 10.42 per cent, the total average being 10.399 per cent, a figure almost equal to that of Meynert and somewhat smaller than all the figures of Weisbach. Of course, I do not conclude from my figures the cerebellum weight in the Dutch to be smaller than in the races examined by Weisbach; I rather believe the ways of severing and weighing, used by the latter, to be somewhat different from my method. It is evident that the precautions in

WOMEN

Origin	Further indication	T.B.W. *Gr.*	Weight Cerebell.	Per cent Cerebell.	Age *Years*	Height *CM.*	Causa mortis
Gron.	Krijthe*	1502	137½	9.15	4	113	peritonit. (app.)
W.G.	15258	1369	125	9.17	25	175	trauma
"	15244	1238	140	11.31	26	160	abortus
Gron.	Lenz	1103	117	10.60	28	145	anaemia
"	Water	996½	126	12.64	31	151	"
"	Smed.	1291	139	10.76	58	154	carc. ovarii
"	Hamm.	1299	145	11.16	64	148	carc. ventric.
"	Bekk.	1102	88	8.00	67	157	vit. cordis
W.G.	15296	1087.5	125.75	11.56	71	159	t. b. p.
"	15310	1059	112	10.57	72	155	nephr. chron.
"	15302	1210	136	11.24	76	155	arterioscler.
"	15244A	1265	123	9.72	80	155	scl. a. cor. cond.
Average		1210.15	126.2	10.42			

Total average percentage in men and women, 10.399 per cent.

* This cerebrum shows a "corpus ponto-bulbare."

weighing of two different authors are never exactly the same. This is also the reason why for comparison with my Mongolian material I used Dutch brains, examined by myself and did not confine myself to figures found by others in Caucasian races. *Duo cum faciunt idem, non est idem.*

My results in 22 Chinese brains, examined in identically the same way as the Dutch brains, are the following:

Origin		Further indication	T.B.W. *Gr.*	Weight Cerebell. *Gr.*	Per cent Cer. T.B.W.
North-Chin.	♂	Body No. 18	1090	128	11.74
" "	♂	" " 15	1130	115½	10.22
" "	♂	Autopsy 0949	1135	124	10.92
" "	♂	Body No. 7	1256	139½	11.10
" "	♂	" " 28	1277	110	8.61
" "	♂	" " 11	1342	128	9.53
" "	♂	" " 21	1468	146	9.94

Origin	Further indication *No.*	T.B.W. *Gr.*	Weight Cereb. *Gr.*	Per cent Cerebellum
Chin. fr. D. E.-India	11	1014	124	12.22
" " "	9	1076	109	10.10
" " "	3	1120	116	10.34
" " "	17	1085	115½	10.64
" " "	14	1170	130	11.11
" " "	2	1161	131	11.30
" " "	8	1171	129	11.01
" " "	4	1195	116	9.70
" " "	1	1228	143	11.60
" " "	5	1261	141	11.18
" " "	7	1295	130	10.04
" " "	6	1261	116	9.20
" " "	15	1271	122	9.60
" " "	10	1344	134	9.97
" " "	12	1425	135	9.47
Average		1217	126.5	10.39

In addition I give the figures found for 8 Japanese brains for which material I am greatly indebted to Professor G. Fuse of Sendai.

Average	Further indication *No.*	T.B.W. *Gr.*	Weight Cerebellum *Gr.*	Cerebellum *Per cent*	Age *Years*	Height *CM.*	C.M.
Japanese ♂	1	1284	139½	10.86	27	146	vit. c.
" "	2	1239	123½	9.96	28	163	t. b. p.
" "	3	1061½	117	11.02	21	154	" " "
" "	4	1296	138½	10.68	28	160	" " "
" "	5	1188	113	9.51	26	153	nephr.
" "	6	1214	119	9.80	36	153	carc. v.
" "	7	1218	122½	10.05	36	156	t. b. p.
" "	8	1198	134	11.25	21	146	" " "
Average		1212.31	125.9	10.383			

The relative cerebellum weight in my Chinese (and Japanese) differs so little from the Dutch, that I hesitate to draw a conclusion. A much larger number of brains would be necessary to ascertain such a conclusion.

I think myself qualified though in assuming the relative cerebellum weight in the Chinese to be practically equal to that of the Dutch. If any difference exists, the weight is *perhaps slightly less* in the Chinese, especially in the Northern Chinese.

It is certainly noteworthy that in the tables of Weisbach the Magyars show a slightly smaller cerebellum percentage than the other races of the former Austro-Hungarian monarchy. This is interesting on account of the fact that the Magyars are generally considered as a largely Mongolian race and that also these weighings were done by the same.

As mentioned at the beginning, Topinard on account of Clap-

ham's work thinks himself qualified to conclude the cerebellum percentage in the Chinese to be considerably smaller than in Caucasian races.

Clapham himself in this article does not make this conclusion, publishing only the figures of the total brain weight in his 16 cases and the weight of the cerebellum connected with pons and medulla oblongata.

Now there are two methods of using the latter figures for our purpose. Both methods include a source of errors.

The first method is calculating the cerebellum weight from the figures for the cerebellum, pons and medulla oblongata, given by Clapham using the statistics made in Europe, the average weight of the human oblongata + pons being, according to Boyd, 1.8% of the T.B.W. (according to Crichton Browne l.c. 1.9%, to Rey, 1.99%). A weak point in this method is our ignoring if it avails with the same average of 1.8%–1.9% for the Chinese also. (I had no pleasure in mutilating my material for controlling this).

A second method is, taking also in Europeans, instead of the cerebellum weight, the weight of cerebellum + pons and oblongata and comparing this weight (which we may call the *metencephalic weight*) with Clapham's results in the Chinese.

In the next table I used both methods reducing to grammes the avoirdupois figures of Clapham.

From this appears that on account of the first calculation Topinard is right in concluding from the figures of Clapham the average cerebellum percentage of his 16 cases to be less than in Europeans, the average in the cases of Clapham being even less than 10 per cent.

Doubting this method of calculating the cerebellum weight from the weight of cerebellum, pons and oblongata to be trustworthy, we may compare the figures, found by Clapham for the whole metencephalon with those found in the English by Thurnam.[14]

On account of 470 weighings (257 men and 213 women) Thurnam determined the metencephalic percentage to be 12.9 per cent in men and 13.1 per cent in women; total average 13.0 per cent.

Now the total metencephalic percentage found by Clapham is 11.91 per cent, so that also this figure would be smaller in the Chinese.

Still we have to be very careful with Clapham's figures.

In the very meeting in which Clapham communicated his results,

[14] Thurnam. On the weight of the brain and on the circumstances affecting it. Journ. of Mental Science, Vol. XII, 1866, p. 1.

Hongkong No.	T.B.W. Gr.	Metenc. Weight Gr.	Metenc. Per cent	Cereb. Weight Gr.	Cereb. Per cent	Sex	Age (approx.) Years
1	1410.3	177.2	13.56	151.8	10.77	♂	30
2	1417.4	163.0	11.5	137.5	9.7	♂	28
3	1516.7	156.0	10.28	128.7	8.4	♂	45
4	1587.5	184.2	11.61	155.5	9.8	♂	40
5	1410.3	170.0	12.06	151.8	10.7	♂	50
6	1360.0	138.0	10.94	111.5	8.2	♂	40
7	1318.0	156.0	11.83	132.3	10.05	♂	25
8	1530.0	187.0	12.50	159.5	10.42	♂	48
9	1403.3	170.0	12.12	144.8	10.32	♂	55
10	1467.5	175.9	12.06	149.5	10.60	♂	35
11	1311.0	138.0	11.11	114.5	8.7	♂	30
12	1289.0	170.0	13.18	146.8	11.4	♀	26
13	1389.0	156.0	11.22	131.0	9.43	♀	38
14	1247.0	138.0	11.93	115.6	9.27	♀	30
15	1204.8	156.8	12.82	134.3	11.10	♀	70
16	1311.0	156.0	11.89	132.4	10.10	♀	18
Average	1385.8		11.91	137.4	9.91		

Distant observed the T.B.W. figures of Clapham to be exceedingly high and to exceed even those given by Barnard Davis for the average skull capacity of the Chinese.

Though the average capacity mentioned by Barnard Davis[15] for the male Chinese skull (47.87 ounces or 1357 cm.^{2}) may be too small, Distant's criticism keeps its value even considering the average skull capacity to be 1456 cm.^{2} as found by Haberer[16] in 28 men from Peking.

The relation between skull capacity and brain weight with pia and ventricular fluid determined by Welcker[17] for this category amounts to 93%. Bolk[18] found in 40 years old Dutchmen figures varying from 90 to 96.5%, Manouvrier[19] however in the French only 87%.

Taking the relation to be 92%, we should expect with an average male skull capacity of 1,456 cm.^{7} a brain weight of 1,380 gr. with ventricular fluid and pia. Subtracting for the latter two $30.4 + 53.6 = 83.5$

[15] Barnard Davis. Thesaurus craniorum. Catalogue of the skulls of various races of man. London, 1867, and the supplement on this work, edited in 1875. I regret this work not to be at my disposal.

[16] Haberer. Schädel and Skeletteile aus Peking. Verlag von Fischer. Jena, 1902 (p. 69).

[17] Welcker. Die Kapazität und die drei Hauptdurchmesser der Schädelkapsel bei den verschiedenen Nationen. Arch. f. Anthropologie. Bnd. 16, 1886.

[18] Bolk. Beziehungen zwischen Hirnvolum und Schädelkapazität, nebst Bemerkungen über das Hirngewicht der Holländer. Petrus Camper, Vol. II, 1902.

[19] Manouvrier. Sur l'indice cubique du crâne. Comptes rendus de l'association française pour l'avancement des sciences. Congrès Reims, 1880. Quoted after Martin. Allgemeine Anthropologie.

gr., we keep as netto brain weight 1,296.5 gr.[20] (in a relation of 90% ± 1,275 gr., in a relation of 87%:1,240 gr.).

In my 7 Northern-Chinese I found the average netto brain weight to be 1,243 gr. whereas Clapham in his Southern-Chinese—who according to my experience have a smaller average T.B.W. than the Northern-Chinese, stated the average male brain weight to be 1,430 grammes!

In my opinion we should be very careful with Clapham's figures.

Apparently Topinard himself doubts the total weight figures mentioned by this author saying (l.c. p. 57) " La moyenne (des poids de l'encephale) was Chinois de Cr. Clapham a étonné tout le monde. Nous attendrons avant d'en tirer une conclusion."

Moreover we are confirmed in presuming Clapham to have made errors in his weighings by the equally low percentage he found in two Pelew natives and one Hindoo, published in the same article.

As appears from my tables the cerebellar percentage found in the Chinese varies from 8.61 per cent to 12.22 per cent, in the Dutch from 8.00 per cent to 12.12 per cent.

So the variation in the cerebellar percentage is about 4 per cent, in the Chinese as well as in the Dutch.

As mentioned above, Weisbach also found large variations and is inclined to correlate this among other things with the length of the body, the increase of which should influence more the cerebellum than the forebrain.

Having at my disposal not enough human cerebra of individuals whose body length was noted,[21] I have tried to consider this problem by determining cerebellum percentages in mammals of the same order but of different size.[22]

The animals in this list are so arranged that the smallest specimen of the order is always placed ahead.

Comparing in this list the large animals and the small ones of the same order, we see in some groups (Rodents, Cetacea, Simiae) the largest representants to have a larger cerebellum percentage per T.B.W.

This, however, is not always, even not mostly so, especially not in Insectivores, Ungulates and Carnivores (Felides), and while the

[20] According to Harvey (l. c.), the average weight of the ventricular fluid is 30.4 gr., while according to Rey (l. c.) the average weight of the pia (wet) is 53.06 gr.

[21] In the Dutch I found up to 160 cm., a larger average than in 160 cm. and more, but in my Japanese the average does not conflict with this conception.

[22] These four figures are taken from Ziehen (Bardeleben's Handbuch der Anatomie).

Whale and Elephant—two exceedingly large animals of different orders—indeed show an enormous relative cerebellum weight, I found on the other hand the small Choloepus didactylus having the very considerable figure of 17.6 per cent.

Order	Species	T.B.W. *Gr.*	Weight Cere. *Gr.*	Per cent Cere-bellum	Fixation
Marsupialia	Didelphys m.	6.17	0.87	14	formal.
	Macropus r.	55.00	7.70	14	"
Rodentia	Mus dec.*	.....	0.25	13	fresh
	Lepus can.*	.....	1.35	15	"
Insectivora	Talpa eur.*	.....	0.17	13	fresh
	Erinaceus *	.....	0.39	11	"
Ungulata Perissodact	Tapirus ind.	265.00	35.00	13.2	formal.
	Equus cab.	468.00	58.50	12.5	"
Artiodact	Tragulus juv.	16.80	1.8	10.7	"
	Oreas liv.	192.00	18.00	9.4	"
Proboscidea	Elephas indic.	3860.00	940.00	24.3	formal.
Cetacea	Phocaena com.	390.00	58.00	15.0	formal.
	Balaenopt. Sibb.	5676.0	1076.0	18.95	"
Carnivora	Felis dom.	23.05	3.5	13.66	formal.
Felidae	Felis leo	197.5	21.0	10.60	"
	Felis tigris	208.2	21.6	10.36	"
Canidae	Vulpes lagopus	28.15	3.55	12.6	"
	Canis fam. box.	73.7	6.0	8.9	"
Edentata	Choloepus did.	34.0	6.1	17.6	formal.
Simiae	Hapale ros.†	....	0.62	7.8	fresh?
	Callithrix py.	42.3	4.8	11.3	formal.
	Semnopith. ceph.	65.0	8.0	12.5	"
	Macacus rh.	70.0	6.3	9.0	"
	Hylobates synd.	105.0	14.0	13.3	"
	Simia satyrus	293.0	38.5	13.2	"

* This figure is taken from Flatau and Jacobsohn's Handbuch der Vergl. Anatomie des Centr. Nervensystems, 1899.

† These weighings were also done without pia, the ventricles being emptied and the brain was cut off near the calamus.

Without doubt other factors than body size influence this relation and in a larger degree even than the latter. The most important factor appears to be the habit of life, especially the manner of moving and the peculiar use of the limbs for moving and grasping.

So, concerning the remarkable contrast between the two Insectivores, probably the very different way of life of these two representants causes the cerebellum of Talpa to be relatively somewhat smaller than in Erinaceus. Overlooking an eventual difference in favor of the forebrain in the hedgehog[23] the larger cerebellum percentage in

[23] Talpa is blind, Erinaceus is not.

the mole may be explained by the movement of the extremities of the latter. This animal is a very sturdy worker, who in his continually digging life, uses his extremities very much, strongly and exactly. Its feet, especially the forefeet, are not only locomotor organs, but also digging instruments, much more so than in Erinaceus.

That special functions of the limbs exercise a large influence on the weight of the cerebellum—especially of the hemispheres—also results from the high percentage of the cerebellum in the Sloth (Choloepus didactylus), an animal that moves extremely slow and prudently and, by the careful manner in which it finds its way in the trees, lays great claims on the innervation of its extremities.

Whereas in the gait of most Quadrupeds bilateral symmetric innervation acts the larger part, in this movement of the sloth careful, slow, bilateral free motions and consequently antagonistic innervation of the limbs are of the utmost importance. This motion is much more complicated than the simple, rhythmic, bilateral symmetric motion, as *e.g.* in Ungulates.

In my opinion the large size of the cerebellum in the Sloth may be alleged in favor of the idea of Leiri[24] that the hemispheres of the cerebellum are connected especially with inhibition of motions by innervation of antagonists since it is supposed that in quick motions the antagonists are activated chiefly in the end of the motion, whereas in slow, searching motions they are acting nearly continually (Wagner[25]).

In still another way my table shows the influence of the function of the extremities on the relative size of the cerebellum.

So the Whale, whose body and T.B.W. are much larger than those of the Elephant, nevertheless has a smaller cerebellum percentage than the Elephant. This difference is certainly due to the poor development of the extremities in the Whale and the exceedingly fine motility (also unilateral) of the Elephant's limbs and trunk.

Consequently we find, for the relative cerebellum weight, the motile capacities, not the size of the animal, to be the main point.

The facts confirm Bolk's conception of the great significance of the extremities, especially their asymmetric unilateral movements for

[24] Leiri. Le cervelet un organe servant à l'innervation des antagonistes dans l'activité musculaire. Acta Oto-laryngologica, Vol. VI, Fasc. 3–4, p. 516. Leiri's conception agrees very well with Ingvar's conclusions and seems to explain very well the symptoms, described by Babinski, van Rijnberk, Barany and Gordon Holmes and others in cerebellar insufficiency. See also Tilney and Riley, The form and function of the nervous system, p. 475.

[25] R. Wagner. Ueber die Zusammenarbeit der Antagonisten bei der Willkürbewegung. 1ste Mitt. Zeitschr. f. Biologie, Bnd. 83, 1925, p. 59; 2te Mitt., ibid., p. 120.

the development of the hemispheres of the cerebellum, a thesis confirmed by the experiments of van Rijnberk and his collaborators, further by Thomas and Durupt and even by Gordon Holmes, who for the rest does not agree with Bolk's theory of cerebellar localization.

That, however, in some cases the cerebellum percentage increases indeed in larger animals of the same order, is seen in Sharks, where the cerebellum, not or hardly fissurated in the smaller representants,[26] shows a large amount of transverse convolutions in the larger specimens of this class. In the larger sharks the greater increase of the cerebellum may thus be demonstrated even ad oculos although it may be expressed in figures also:

Name	T.B.W. *Mgr.*	Weight Cer. *Mgr.*	Cereb. *Per cent*
Scyllium can.*	666	96.5	14.5
Galeus canis	8750	1390	15.9
Lamna cornub.	17110	3580	20.9

* These figures are the average of three weighings.

Though in some sharks which have a different way of moving than the ordinary ones (f.i. Angelus Squatina) also contrary relations may occur, the relative increase of the cerebellum compared to the cerebrum in larger specimens is not surprising, the development of the corpus cerebelli being largely a function of the musculo-sensory system of all parts of the body, whereas the development of the brain in these animals depends almost wholly on the senses of smell and vision. Also the forebrain in mammals contains areas (smell, vision, hearing), the development of which is no function of the body. In the cerebellum of fishes this would avail only for the auriculus, the development of which does not depend on impulses of the spino- and olivo-cerebellar systems (ponto-cerebellar systems do not yet exist in fishes), but on the NN. laterales (and N. VIII).

So in some bony fishes where the N. lateralis is very large (Mormyrus) the cerebellum increases enormously by the huge development of the auriculi and the associated valvula.

Finally I would like to point out that a determination of the relation between cerebellum weight and body weight and between cerebellum weight and the weight of the spinal cord without doubt will cast more light on this subject.

Besides it would be interesting to examine the individual variations, so considerable in Homo, also in some of the mammalian species of which a good many specimens may be obtained (as in dogs, cats, etc.).

[26] Confer Ariëns Kappers, Vergleich. Anatomie des Nervensystems, Part II, page 647, and Voorhoeve, Het Cerebellum der Plagiostomen, Dissertatie, Amsterdam, 1914.

OCCLUSION OF THE POSTERIOR INFERIOR CEREBELLAR ARTERY *

By George Wilson, M.D., and N. W. Winkelman, M.D.

PHILADELPHIA

The symptomatology of occlusion of the posterior inferior cerebellar artery was first firmly established by Wallenberg (1) in 1895; since then many clinical cases and a few with necropsy have been recorded. Hun and Van Gieson (2) in 1897 and Spiller (3)

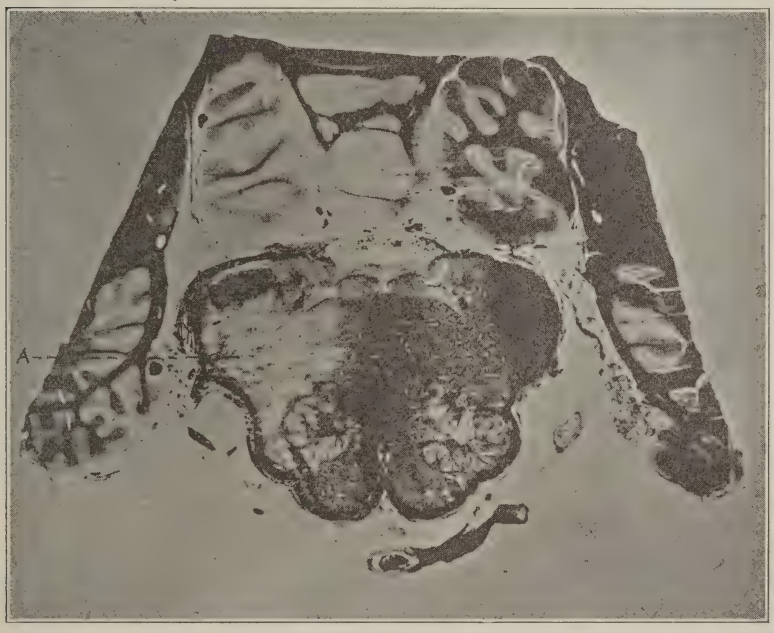


Fig. 1. Medulla at maximum involvement "A."

in 1908 were the first Americans to report cases with necropsy. Goldstein and Baumm (4) in 1913 reviewed the cases reported up to that time, tabulated the symptoms and concluded from their statistical study that the most constant clinical sign was a loss of pain, heat

* From the Neurological Department of the School of Medicine of the University of Pennsylvania, the Episcopal Hospital and the Laboratory of Neuropathology of the Philadelphia General Hospital.

and cold in the area of the fifth nerve on the side of the lesion and on the opposite side of the body. Since 1913 only an occasional article has been written on the subject; one of the most recent and important is the one by Foix, Hillemand and Schalit.(5) These authors consider the vascular distribution of the medulla as follows: (1) The paramedian artery supplying a triangular area which includes the pyramid, fillet and part of the olive. (2) The artery of the lateral fossa of the bulb which nourishes the lateral portion of the medulla

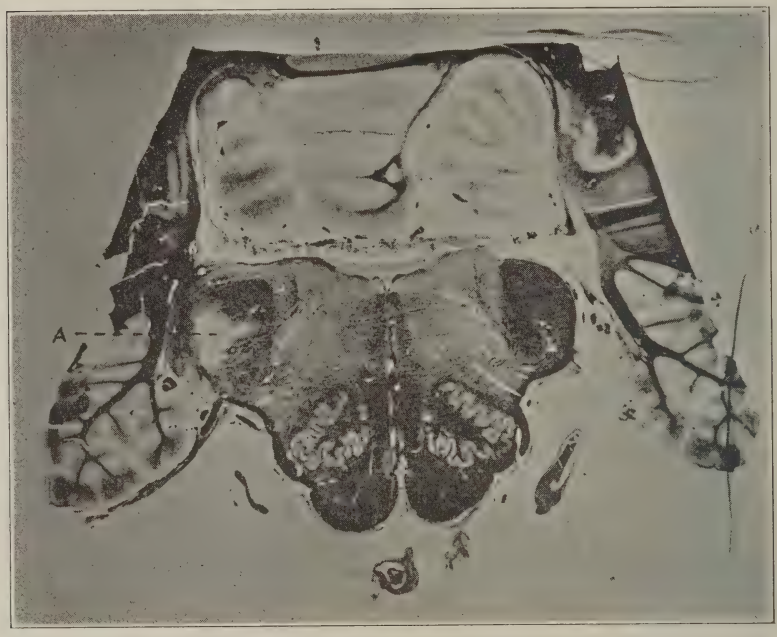


FIG. 2. Medulla at the summit of the inferior olive showing upper limit of lesion "A."

except the restiform body which is supplied by (3) the inferior cerebellar artery. They believe that the "artery of the lateral fossa of the bulb" is the one that is usually involved in the "syndrome of the posterior inferior cerebellar artery occlusion" and not the inferior cerebellar artery itself; but as will be seen from our illustrations the restiform body is also involved in the softening and this case at least does not fit in with the rigid classification given by the French authors. It is true that clinically there would be no difference in the symptomatology since the same cerebellar symptoms could occur from involvement of the cerebellar tracts themselves prior to their entrance into the cerebellar peduncles.

The following cases, one with necropsy, are herewith reported:

Case 1.—A white male, fifty-four, with a negative family history, had smallpox in 1871 but denied syphilis. He drank as much as a quart of whisky a day. On September 28, 1918, he suddenly felt a sharp pain in the right occipital region which crossed to the left side of the head and radiated down the left arm and leg. He became unsteady on his feet, but managed to get home without assistance although he was very dizzy. He developed difficulty in swallowing and his voice was reduced to a whisper. He did not see double and did not vomit.

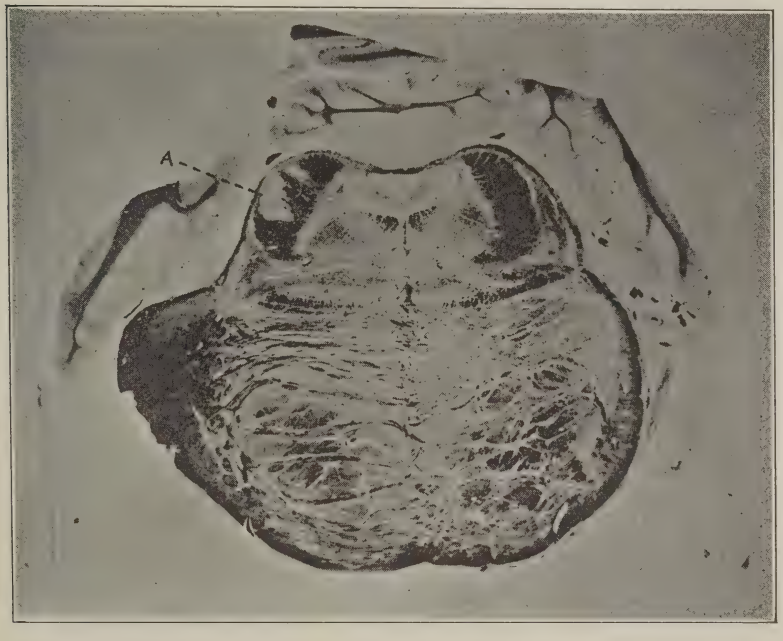


FIG. 3. Pons showing small lesion in superior cerebellar peduncle at "A."

He stayed in bed four weeks because he staggered like a drunken man. The entire left side of the body felt numb and dead, and at times he had the sensation of pins and needles there. The face was not involved in this paresthetic phenomenon.

At the end of a month he left his bed for the first time although he still had a tendency to stagger when walking. He noticed when he touched a hot object with the left hand it did not give him the sensation of heat but of tingling. He had been very drowsy since the onset of his trouble. He never noticed any difference in the amount of perspiration on the two sides of his body.

Examination.—He was seen on June 2, 1919, nine months after the acute attack. He walked with the base of support widened and he had

a tendency to stagger to both sides. He had a distinct sway with the eyes open; when the eyes were closed he deviated to the left, although he then actually fell to the right. The right pupil was smaller; both were irregular and reacted sluggishly to light. The right palpebral fissure was narrower than the left. The eye grounds were normal; the vision was 6/25 in the right eye and 6/200 in the left. The ocular, fifth and seventh nerves were normal. The uvula when moved was drawn upward and to the left; stimulation of the pharynx on the left produced gagging and on the right no response. The right vocal cord was paralyzed.

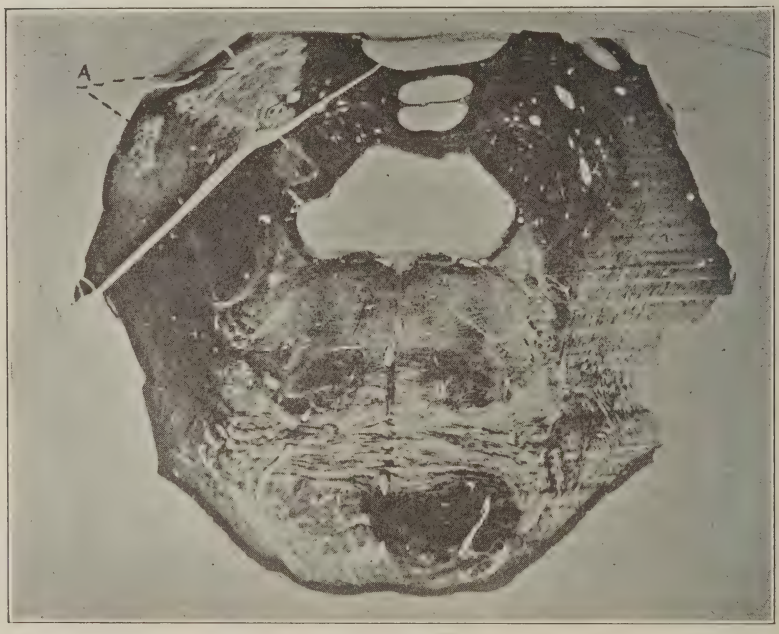


FIG. 4. Showing lesion in middle cerebellar peduncle "A."

The Barany Tests (performed by Dr. Lewis Fisher) summarized were as follows: The vestibulo-ocular tract from the horizontal canal on the right side showed slight evidence of disturbance, because the nystagmus produced was of the normal horizontal movement but was mixed with an oblique movement. The vestibulo-cerebello-cerebral tract for vertigo from the horizontal canal did not function at all, thus indicating that something had interfered with it after it had become separated from the vestibulo-ocular tract, most likely in the right restiform body. The absence of vertigo and practically no nystagmus from the vertical semicircular canals suggested an interference with the vertigo as well as in the nystagmus tracts from these canals. Dr. Fisher con-

cluded from his examinations that the disturbance was due to interference with the circulation involving the brain stem on the right side about its middle.

Muscular power was good in all four extremities. All the deep reflexes were active and equal on the two sides with the exception of the Achilles reflexes which were lost. Plantar stimulation produced flexion of the toes on both sides. Slight adiadokokinesis was noted in the right upper extremity.

Sensation: stereognosis, vibratory sense, sense of position and touch were normal throughout, but pain, heat and cold were diminished but not lost on the left side of the body. Sensation was not affected on either side of the face and the corneal reflexes were normal. The blood Wassermann, urine, blood pressure, and heart were normal.

The man made a good recovery but at the time of his last examination still had the clinical evidence of his lesion.

Case 2.—A white woman, forty-eight years of age, was admitted to the Episcopal Hospital on March 15, 1924. Her husband had died two years previously and had suffered for some years before his death from tabes dorsalis. Ten years before her admission the patient had a generalized skin eruption presumably due to syphilis. Her chief complaint was inability to swallow. About one month before she entered the hospital, she suddenly developed numbness and weakness in the right arm and leg and thickness in speech. In three or four days she entirely recovered and returned to work. Three days before admission she suddenly developed difficulty in swallowing, numbness of the left side of the face and difficulty in speaking.

Examination.—Distinct narrowing of the left palpebral fissure was present, due to enophthalmos. The left pupil was smaller than the right and was irregular; both pupils reacted well. The eye balls could be moved freely in all directions. The corneal reflex was lost on the left side. The nasolabial fold on the left was deepened and suggested the condition seen in an old facial palsy, however, the movements of the face were normal on both sides, and no changes in the electrical reactions were present. Saliva continually ran from the mouth and great difficulty in swallowing was noted. She could barely whistle but could blow out a match at a fair distance from the mouth. The tongue was protruded in the midline. The patient was too ill to stand or walk. Both patellar reflexes were present, the right was exaggerated. Plantar stimulation produced an atypical Babinski on the right and flexion of the toes on the left.

Sensation: A marked impairment of pain, heat and cold was demonstrable in the distribution of the left fifth nerve and on the right side of the body. Sense of position and stereognosis were normal. An ataxic tremor was present in the finger to nose test on both sides.

Laboratory examination: The blood Wassermann test was plus two

in the cholesterinized antigen. The routine blood examination was normal and her urine showed the findings of nephritis. A bloody spinal fluid was obtained due to local injury.

Clinical Course and Outcome.—The patient lived twelve days after admission to the hospital. In this time the tongue protruded to the right and the temperature of the right side of the face was definitely higher than on the left. She developed retention of urine and later incontinence. She died suddenly.

Pathology.—The brain on gross examination showed moderate convolutional atrophy, haziness of the pia arachnoid and intense plaque formation of the vessels, although no thrombosis could be made out. Microscopic examination: A serial section study was made of the brain stem and midbrain. On the left side of the medulla was an area of softening (Figs. 1 and 2) which was quite recent and occupied the region of the restiform body and all structures anterior to it up to the inferior olive. The lesion was widest at about the middle of the medulla and extended upward and downward in a cone shape. Other small areas of softening were found, one involved the left superior cerebellar peduncle (Fig. 3), another and larger area was found in the left middle cerebellar peduncle (Fig. 4) and in the left lenticulo-capsular region. The pyramidal system showed no degeneration by the Weigert or Marchi methods. The vessels uniformly were thickened especially the smaller ones.

Comment

We believe that the two cases reported above are instances of occlusion of the posterior inferior cerebellar artery. The one with necropsy undoubtedly had this condition and in addition had other areas of softening in the cerebrum and brain stem, the condition being syphilitic in origin. The first case was unusual in that there was no clinical evidence of implication of the descending root of the fifth nerve. The involvement of the descending root of the fifth nerve in the medulla is one of the commonest signs in this condition; however, other cranial nerves were involved and helped to make the localization possible in this case.

BIBLIOGRAPHY

1. Wallenberg. Archiv f. Psych., 1895, Bd. 27, S. 504; Archiv v. Psych., 1901, Bd. 34, S. 923; Deutsch. Zeitschr. f. Nervenheilk., 1911, Bd. 41, S. 8; Deutsch. Zeitschr. f. Nervenheilk., 1901, Bd. 19, S. 227.
2. Hun and Van Gieson. N. Y. Med. Jr., 1897, LXV, 513, 581, 613.
3. Spiller. Jr. Nerv. and Ment. Dis., 1908, 35, 365.
4. Goldstein and Baumm. Archiv f. Psychiat., 1913, 52, 335–376.
5. Foix, Hillemand and Schalit. Revue Neurolog., T. 1, No. 2, Feb., 1925, p. 160.

VERTIGO AND THE DEATH WISH *

By Ernest E. Hadley, M.D.

WASHINGTON, D. C.

Vertigo is a not unusual complaint of either primary or other order and as a component part of certain well-marked symptom groupings, entails no remarkable diagnostic acumen. While the purpose of this paper does not include differential diagnosis, attention may be directed to some of the more usual conditions giving rise to what is termed in popular parlance, dizziness or giddiness.

Roughly, vertigo may result from any unusual alteration of the afferent impulses to the cerebellar centers of coördination or from lesions directly affecting such centers. Diseases of the ear occasion rather frequent insults to the sense of equilibrium. Foreign bodies or impacted cerumen in the external ear, irrigation of the external meatus with hot or cold solutions (especially if there has been a perforation of the tympanic membrane) and sudden changes in pressure are common causes of dizziness. Pressure affecting the stapes or fenestra rotunda, inflammation or blockage of the eustachian tube, chronic middle ear suppuration and inflammation or erosion of the walls of the tympanic cavity may also give rise to vertigo. The most common causes for aural vertigo arise from diseases affecting the internal ear or labyrinth. Unequal pressure of the endolymph of the semicircular canals, Ménière's Disease (sometimes considered due to a sudden increase of or hemorrhage into the endolymph); lesions of one or more of the semicircular canals; syphilis of the internal ear (more usually of congenital origin) and lesions of the cochlear apparatus are the common offending agents. Those who are susceptible to changes in the endolymph find rotation, swinging, flying, etc., extremely uncomfortable. Vertigo is a relatively minor accompaniment of otosclerosis. Severe vertigo may be occasioned by an increased intracranial pressure such as that due to cerebral or cerebellar abscess or tumor. A neoplasm affecting the middle lobe of the cerebellum is one of the best examples. An intracranial tumor affecting the vestibular fibers in the auditory nerve may cause vertigo. The so-called traumatic vertigo may arise from a fracture of the base

* Read at the February, 1926, meeting of The Washington Society for Mental and Nervous Diseases, Washington, D. C.

of the skull or from concussion. Conditions favoring fatigue of the ciliary muscle or of the extraocular muscles, diplopia or near diplopia are frequent exciting factors of vertigo. For this reason optic neuritis should always be sought whenever dizziness is given as a complaint. Sudden, repeated or rapidly changing visual impulses such as looking from a near to a far object; gazing at an object through the bars of a fence while passing or riding on a train stimulate dizziness. Variations of the blood pressure may cause a vertigo. Increase of blood pressure as occurs in arteriosclerosis and nephritis or a decrease as in anemic conditions, Addison's Disease and chronic or prolonged illnesses are the more commonly known causes. Malnutrition, gout, digestive and gastro-intestinal disorders favoring the liberation of toxins are as well known causative factors for vertigo as alcohol, tobacco and certain drugs like the atropa group. Diseases of the cord as in tabes dorsalis, multiple sclerosis, tumors, etc., and alterations in cutaneous, joint and muscle sensibility may evoke subjective states difficult to distinguish from dizziness. Endocrine imbalance, disorders or stimulation of the pituitary, adrenals, etc., and finally emotional tension states, fear, fright, anger, and conflicting strivings in general are to be considered in an etiologic connection.

While this is an inadequate consideration of the various conditions giving rise to vertigo the purpose of this paper has to do with certain psychologic factors bearing fundamentally upon this as a major complaint in a "neurosis." The method of procedure will be an attempt to unfold the problem as it was at first revealed to me with some modification in view of the time element. Since the entire therapeutic handling of the patient cannot be discussed here, the selection, for the most part, of dreams hereinafter recorded, has been made from the first stage of the analysis during which no explanation of dreams or symptoms were offered to the patient. Liberal reference to remarks made by him during this period will be included and no other historical material will be offered except that so kindly furnished me by Dr. Kerr from whom the patient was referred. The only modification in this report relates to tense and person.

This report is to the effect that, the patient, then eighteen years of age, was referred to Dr. Kerr by Dr. E. L. Morrison, March 7, 1921. Dr. Kerr learned that the history, relating to the problem at that time, "was of no importance up until a year before when he began to suffer with headaches. Glasses were prescribed, but without relief. Two months later he developed double vision which persisted for two months. Shortly thereafter, he began having attacks of numbness on the right side of his right foot which spread upwards and lasted a few minutes.

These attacks occurred about twice a month. In a short time, throbbing in the right ear was noticed and has been continuous—not a true tinnitus. Two months ago he commenced to have weak spells—a feeling of vertigo on suddenly changing his position. His headaches continued throughout, growing gradually worse." During the month preceding his first visit to Dr. Kerr he had "vomited after breakfast. He consulted Dr. Morrison who discovered a bilateral choked disc." On February eighth, one month before Dr. Kerr saw the patient, "a lumbar puncture by Dr. Hough showed clear c. s. fluid under increased pressure with increased protein and three cells per cm. The Wassermann reaction was negative. The blood Wassermann was also negative. On February eighteenth, Dr. W. Cabell Moore made an exhaustive study of the case and found a moderate coarse lateral nystagmus, a rather high blood pressure, absence of the right abdominal reflex and marked increase of the red blood cells. Otherwise the examination was negative.

"Dr. Dabney found hyperemic unhealthy looking tonsils with a thin purulent discharge and a chronic granular hypertrophic pharyngitis. Thinking that a possible toxic labyrinthitis from the tonsils might be the cause of his vertigo, occasional nausea and nystagmus, the tonsils were enucleated on the twenty-fifth of February without producing any marked change in his condition.

"On examination," by Dr. Kerr on the seventh of March, "the patient proved to be rather sparely built, of fair nourishment and good color. The Romberg was negative. The finger to nose test was negative and there was no adiadokokinesis. He could maintain station on either foot, but not with eyes closed. There was a coarse lateral nystagmus, more marked to the right. There was no spontaneous past pointing. Of the cranial nerves, the first was normal. The second showed a marked choked disc, bilateral. The pupils reacted to light and distance. There was no extra-ocular palsy. The fifth was normal. There was a good corneal reflex. The seventh and eighth were normal. There was no pharyngeal reflex. The movements of the palate were equal. The patient could not differentiate taste on the left side of the tongue, front or back. There was no atrophy of the tongue. The pulse was 100 at rest and 120 after exercise. The power in the trapezii and sternocleido mastoids was normal. The cremasteric reflex on the right was absent. The muscle power in the lower extremities was good and equal. The knee and ankle jerks were equal and good. There was no Babinski or clonus. Sensation to cotton, wool, pin pricks, heat and cold was unimpaired. The joint sensibility was unimpaired. The X-ray was negative except for faint convolutional markings throughout.

"April 1, 1921.—Under general anesthesia a small incision was made behind the right ear with the idea of performing a decompression, provided the patient did not have internal hydrocephalus. The dura was incised. The brain needle was inserted to a depth of 4 cm. when a large quantity of clear c. s. fluid escaped under pressure, demonstrating

an internal hydrocephalus. The incision was closed and the patient placed in the cerebellar position. With a typical crossbow incision a subtentorial decompression was performed. The dura was found tense and bulging. A dark area could be seen under the dura on the left side. The dura was opened over both hemispheres. A dark red mass presented in the middle of the left cerebellar hemisphere about the size of a large egg, but not adherent to the dura. The mass was well demarked from the surrounding brain tissue, though there was not a very definite capsule. The bulk of the tumor was in the cerebellum but one-third of its circumference presented on the surface. After ligation of several pial vessels the tumor was gently dissected out, with very little hemorrhage. The muscles and muscle sheaths were sutured back in place with chromic cat gut and the skin closed with silk worm gut. There was no drainage. A plaster cast was applied which included the head, neck and upper thorax.

"Convalescence was excellent, though a marked nystagmus persisted. The patient was able to sit up after the fifth day. On the tenth day after the operation the cast was removed and the sutures taken out. There was primary union. A few days later some clear c. s. fluid escaped from the stitch hole intermittently for several days and then ceased. The patient was out of bed the fifteenth day and able to walk without assistance.

"May 20th, Dr. Morrison reported the eyes were about normal. There had been no headache. There was some slight uncertainty in walking. The Romberg was negative. There was no nystagmus to the left. The deep reflexes were equal and active. The patient was still unable to recognize taste on the left side of the tongue.

"The tumor was carefully studied by Dr. N. D. C. Lewis, who summed up his report as follows: 'Since the neoplastic cells are unquestionably of endothelial origin, and as the vessels seem to belong to the tumor process, in my opinion this tumor is an *angioendothelioma of slow growth.*'"

Three years later this patient returned to Dr. Kerr complaining of much the same subjective sensations as he had had prior to his operation. Prominence was given to the subjective feeling of vertigo and the patient thought he was developing another tumor. After a careful examination Dr. Kerr was convinced of the absence of neuropathology and referred him to Dr. Lewis. A few interviews with Dr. Lewis relieved the patient somewhat, but after an interval of several weeks he returned with an acute exacerbation of his complaints. This was in December of 1924. Dr. Lewis was unable at this time to see the patient and he was obliged to refer him to me.

When, after the introduction, Dr. Lewis left the office, the patient was reluctant to speak of his condition. Quite frankly he objected

to the therapeutic handling of his problems by other than the one to whom he had been referred. He appeared quite agitated, sat with his head resting on the palms of his hands or walked about the room with his hands pressed to his forehead. He said that he was too ill to talk. But, finally, in response to my query about the nature of his complaints, he responded by saying that he was quite certain he would have to be operated upon for another tumor. He spoke of the similarity of his present symptoms,—dizziness, clicking sounds in his right ear, weakness, and nausea without vomiting, inability to concentrate on his work and disturbing thoughts, to the sensations that he had had prior to his operation something over three years ago. The dizziness was of a subjective nature, the phenomenology of which was not clearly described. Sometimes he felt confused, or just weak with blurring and unsteadiness. He had not fallen and such sensations had occurred while standing, sitting or prone. Objects did seem to move at times. He did not recall what direction, perhaps to the right as he sometimes felt like turning or falling to the left. He thought the sensation of dizziness had occurred without relation to any sudden motion of his own and did not know but that it might have some relation to his worries at home.

After considerable indecision he decided to return on the following day when he thought that he might feel more like talking. The second interview was scarcely more productive. He arrived twenty minutes late, objected to the location of the office and the small size of the room which gave him a "closed-in feeling." He was "terribly upset" on seeing an excited patient in the hall, and could not sit or lie down but paced the office making objections as indicated. He complained of dizziness, thoughts which ran through his mind without control, and thought he was going insane. He explained that he, his mother and little sister lived together and that they rented a room to a man to assist them, financially. He was afraid that his mother might marry this roomer and because of his financial burden could not "get rid" of him. He said that he was very much in love with his mother and that any display of friendliness between his mother and the roomer made him extremely jealous. He worried when away from the house for fear the mother might commit some indiscretion. It pained him to distrust her. He was morally certain that the mother would not execute a social error but such unwelcome thoughts occurred to him. If he did not worry about this he was worrying about a recurrence of his tumor. Worry stimulated this dizziness and he could see no way of obtaining relief. Talking made him feel worse. He blamed his father for his unhappy state. The father had "told

a lot of lies" about his mother during the divorce preliminaries and later caused them to lose the home into which he, the patient, had placed his savings.

Following this abbreviated interview, he returned for the third hour with the following dream:

> *"I noticed a truck on a station platform—well loaded and ready to be shipped to Washington. It seemed the station was the one where my father used to be station agent and had to do all that heavy work by himself. My father was in the dream and he mentioned having seen me several times that day. I compared him to our roomer and thought my father a better man. In the dream, there was a monkey on the truck, tied to a chain. I played with the monkey in the dream and it made me dizzy—just like the dizzy spells I have in real life.*
>
> *"There were two freight trains and two men—hoboes—had a board which they were going to put under the car to take a ride. One crawled under the wrong train and it pulled out carrying him in the wrong direction.*
>
> *"Then I was sitting in a room with my mother. She said that she was thinking of my brother who drowned about two years ago. It seemed that we were in this town where father was station agent. Father was in this dream making bread."*

If we are to understand the meaning of these dreams, we must first bear in mind the immediate situation. The patient has decided to bring his problems to me, hence the well-loaded truck[1] on the platform ready to be shipped to Washington. The starting point in the dream, as in life, has to do with his father. While the patient has said that the father is responsible for his unhappiness, the dream expresses a favorable comparison of him over the roomer and a sentiment of sympathy for him on account of the amount of work he had to do "all alone." Such an identification with the father might be seen to have motivation in the perceived affection of the mother for the roomer since he is losing his mother's affection as his father lost it. This sympathy for the father in the dream on account of the hard work he had to do is a reflection of his own situation. He must now slave to support a mother who no longer loves him. There is no joy in such a responsibility for he has to work "all alone"—without the reward of her love. The suspicions of the mother which he strives to repress are almost identical to the allegations of his father.

This brings us to a consideration of the patient's associations to

[1] The patient's associations to "truck" include the remark, "I have a whole truck-load of troubles."

" father " during the hour. He said, " My father never provided for the family. Ten years ago, mother and he could not get along. He accused her of terrible things. Now mother is my ideal. She is a fine woman. Father never brought out in court the things he charged. I really think the roomer is a nice man but he has a way I don't like. I really think she intends to marry him. In my dream I thought that my father with all his meanness was a credit to this roomer. I really had a sorry feeling for father. He was to be pitied in spite of the way he treated us. I am sorry for him. I hated him for the way he treated me—leaving everything on my shoulders—he drank—never took care of himself—always looked shabby—couldn't hold a job—but after all father done to us I'd help him out if he was in trouble."

Here, of course, it is the patient who is in trouble. Since the death of his elder brother, he has held a position in the household of relative importance. Not only has he been the sole male support and the head of the family, but he has received a degree of affection of an almost completely satisfying nature for one so young. Now into this romantic arrangement there comes a foreign element in the guise of a roomer. This gentleman is of, at least, moderate means and what he pays in the way of room rent does help lighten the boy's financial burden. Regardless of the mother's feelings which might be quite contrary to the boy's suspicions, a matrimonial arrangement would, from the financial point of view, offer the patient complete freedom of the support of the family. However, the possibility of the mother transferring her affection to the roomer fills him with alarm. Quite frankly, he states that he is tormented with jealousy. He loves his mother and cannot endure even a manifestation of friendliness between them. The assumption, that his troubles have to do with his love problems, appears very well founded.

On the truck which was dramatized as being well loaded with these problems, he was attracted to a monkey tied to a chain. Stroking the monkey caused a dizziness similar to that of which he complained. First of all it may be well to consider his associations to " monkey."

He said, " I liken this monkey to the roomer. He is a silly babyish old fellow. When I come in he goes out and when I go out he comes in. I told mother that I liked a man who would face a fellow. He isn't friendly to me. I feel in my bones that mother intends to marry him. He is just like a monkey and that makes me think of anything foolish or insignificant. It seems to me like all that Dr. Lewis told me vanished. I'm always trying to develop new symptoms. We talked of my love for mother. I've always been tied down to her. While I have girl friends, I've called none of them up, recently.

To my mind I have never met a girl like my mother. One day I was sick at home, but when she came near—well, it seemed better when she stayed out. Now when I am out some force seems to get me back into the house. Nevertheless I feel better when I am at work if I can just keep my mind off of the things at home."

The idea of the roomer as a silly, babyish old fellow comes up as the first association to "monkey." Again a monkey may be "anything foolish." Further associations to "silly" and "foolish" ecphoriate the time worn admonition that masturbation causes silliness, foolishness or insanity. "Monkey" is later recalled as a colloquial term for the genitals, so that dream behavior in the form of "stroking a monkey" does not seem difficult to understand. Yet a matter of primary importance has to do with its linking up to the emotional background. A monkey being considered somewhat lower in the phylogenetic scale may very well symbolize the primitive nature of that emotion. Perhaps we should say the "babyish" nature of that emotion inasmuch as the roomer of which the monkey reminded our patient was a "babyish old fellow." This infantile attachment to his mother is very nicely brought out in the expression that he has "always been tied down to her." Then the monkey in the dream tied down by a chain is really a dramatization of himself. It is now clear why the monkey reminds him of the roomer of whom he is jealous since the intentions of the latter remind him of his own secret cravings for her. In other words, he finds, though not as yet consciously, an identification of his evil nature in the person of the roomer. In the suspicion that the mother may have some sexual relation with this roomer, the boy is merely stating in a less offensive manner his own incestuous craving. The train carrying the hobo in the wrong direction is a further symbolization of the above emotional trend. A dramatization of the sexual act may be seen in the use of the board which the hoboes placed under the car to take their ride. The idea of the father and the roomer as the two hoboes does not alter the significance of the dream to him. The latter dream of the father "making bread" may be compared to the stroking of the monkey in the first dream. Indeed, "it is not father who had to make the bread, that was my job." Neither was the brother obliged to "make bread" since he was always away with the girls and occasionally told our patient of his conquests. The full significance of these thoughts about the brother imputed to the mother in the dream is not entirely clear from the associations of the hour. However, he said, "When brother died some two years ago we all took it pretty hard—although he did not stay around the house much. I had to go

to Miami to take care of everything. Father did nothing, though I believe he did pay the expenses at the time of the funeral. Then I felt awfully important and when people came to view the corpse I would say that I was his brother."

Suffice it to say that these dream thoughts are of death. And, we are aware of how upset—dizzy—the patient has become in view of a possibility of an interruption of the mother relationship. Such an interruption of a state of comfort must have its analogy in the phenomena preceding birth so that the roots of vertigo must here be found in the Death-Evil preconcept.[2]

To the next hour he brought a dream which we shall briefly consider.

> *"I was standing in a road with a bunch of men, all of whom were eating ice cream. I could see my mother and sister coming down the road on horseback. I asked if the horse was all right. Then I became mad and irritable because I had no ice cream and took some from someone else. I then noticed the horse had one shoe off. I did not want these fellows to see my mother on account of the divorce proceedings which were going on."*

The affect reaction in the dream is given as, "Irritable, mad, dizzy." And he says that "everything at the house gets on my nerves—at the present time I seem to have more affection for my sister and more mad toward mother. Sister is a lively kid and she

[2] Sullivan, in his clinical researches upon the motivation in schizophrenia, has formulated a notion concerning certain primary constellary phenomena which he calls *preconcepts*. The material of the last of these in the sequence of events immediately precede the termination of the uterine state. To this is given the apt designation, Death-Evil. A brief discussion of preconcepts is to be found in his "The Oral Complex" (The Psychoanalytic Review, 12:32, January, 1925). Further elaborations of this appear in his other contributions.

Briefly, as I see it, the Cosmos preconcept includes a felt pleasure—comfort—condition described by Sullivan as "a content of universal subjective participation" or a mental state to which the term omnipotence might be applied. The interruption of this state of comfort is the beginning of the Death-Evil perceptions, and, to quote the author, is brought about by "emphatic changes in the fluid tension, hormone content of the blood and the foetal biochemistry"—the concomitants of the inception of labor (or surgical interference). Impressions from the end-organs continue in ordinary labor up to the period of foetal "unconsciousness" occasioned during engagement of the head. The functional activity of the sensory nervous apparatus and vegetative systems give rise to experience which is, of course, devoid of meaning except in so far as it has affective tone referable to the impulses making for the continuation of life. Only by reflecting can we appreciate the ghastly and cataclysmic nature of this event.

In the genetic sense, all post-natal experience involving "pleasure and pain" would have relationship to these basic Cosmos and Death-Evil preconcepts. He believes that the affective aspects of experience are relatively little differentiated in the course of life and that practically unmodified affective radiations of the most primitive sort may appear in consciousness; for example, in panic.

gets on my nerves. When I awake I hear mother getting breakfast and talking to the roomer. I imagine they are talking about me. I feel better if I am in the room where they are. One evening mother walked into the room and made me unusually irritable. When I come in the roomer goes out—or the other way. When he is friendly, I feel somewhat relieved."

Associations to "ice cream" were not very productive—yet he said that he cared very little for cake or ice cream. Chocolate ice cream, as in the dream, is the only kind he cares for. There he was mad because the men had something nice which he alone did not have. The anger, irritability and dizziness is occasioned in the dream because of his lack of ice cream—later understood as a sexual sweet—and in reality because he feels that he is losing his place in his mother's affection. Then in the dream he obtains the ice cream by a bit of trickery and in the waking state he feels more affection for his sister, a sort of substitute love-object for the mother.

Now there is another element in the dream. The horse—his horse, has lost his shoe. This brings to mind an old saying, "For the lack of a nail the shoe was lost, etc." His mother, we learn, is an excellent horsewoman, robust, vigorous and athletic. This brings to mind his irritability about the house of late, his lack of ambition, disinterest in calling up any of the girls and that temporarily he is distracted from his ills by associations with some of the fellows. Certainly the affect of the dream, irritability, anger and dizziness, is quite closely related with things not obtainable, losses, the castration complex and the Death-Evil preconcept. The latter affect in the dream, a feeling of shame on having the fellows see his mother during the divorce proceedings, is stimulated by the allegations of the father about the mother. Similar suspicions have entered his consciousness. Since we have learned how such suspicions relate to his own secret cravings, the feeling of shame is readily understood. Then the idea of divorce brings up the thought of separation and the widening of the mother's personal interest in both the sister and himself.

The dream of the following hour is quite brief. He dreamed that:

> *"I was on a ward with a lot of insane patients. I awoke with a feeling of great fright."*

His associations, somewhat abbreviated, need no further explanation. "The first time I came to see Dr. Lewis, I told him that I thought I was losing my mind. I can imagine myself as being a patient here. This week I have been away from work, my thoughts have been constantly on this roomer, my mother, home and the opera-

tion. I got to feeling I wasn't wanted around the house. I felt I couldn't go home and was not at ease. I remember when I was a child my mother would say, 'you must not have good sense,' or 'you must be crazy.' She talked that way to sister and I told her not to. . . . When father made those accusations about mother, people said he must be out of his head. . . . The first time I came out here I imagined my nerves might crack and I couldn't get out of here. I often wonder if brother wasn't better off since he has missed what I have gone through . . . I can't stand it to see these poor fellows (patients in the Hall). Mother used to say 'if you read too much you will go crazy.' . . . I remember one morning going down on the street car that I saw my father walking along the street. He looked pitiful, then at the same time I thought what a hateful fellow he was. I ofen see middle-aged men walking with boys and I wish I had a father to do that—to take an interest in me. Only once did father take us two boys anywhere and that was to a bowling alley. If I went any place it was with mother. The only pleasure I have had has been through her. It just entered my mind that I might get rid of all these responsibilities if I was insane."

The fear-affect here exposed is the obverse of the desire, which might be reworded as follows: "I wish that I might be insane so that I might evade the problems of life." This death wish is expressed somewhat more clearly in a dream of the thirteenth interview. However, before proceeding to it, we may consider a dream impression of the seventh hour.

> *"It was a sort of an emotion or sensation in which I seemed to be losing something. One moment it was almost unbearable and the next moment it seemed to take a great load off of my mind."*

The dream reminds him of "the home situation." "This roomer is unbearable—yet in view of the rent he pays, I could scarcely get along without him. Last night I got to talking with him and he did not seem so bad. At first I was quite tense, but after talking a while, eating some cake and drinking some wine, I went out feeling a great deal better. Yet, I cannot keep this operation idea out of my mind. It seems to blot out everything else. If I feel good for a minute then I feel worse. I got terribly worked up on seeing that man outside (a patient in a panic state). I don't know what might have happened if I had not been admitted. He reminded me of my father, even as to size, voice, etc." There is a pause—then—"After father left, I used to have to sit around the house on Sunday. That was an

unbearable tied-down feeling. I used to say that I couldn't stand being head of the house much longer. One day, mother said that it was hard for her too as she was still young. I had to buy things at the store, take the man's place and it upset me for I was not strong. When these operation thoughts come on I get a sensation in my ear which makes me dizzy and sick. If I get in a barber chair I get upset and sick, especially if the barber gets to working around that scar. I can't remember, but I was very dizzy for some time after the operation. Brother was the first to see me after I came out from the ether. I don't remember when I started to have dizzy spells again but it was not until after brother died and I had that unbearable feeling of having to sit around the house—being tied-down as head of the house supporting mother and my kid sister. I felt tense all of the time. Sometimes I think of myself as a sissy and the fellows intimate that I am a home-loving baby. I have been that kind and in talking to people they detect it. Once at a party a lively girl there wanted to drink and we did. Something was said and she replied, 'Oh! you're virtuous, your mother said so!' That struck me hard. Mother enters into everything . . . a fellow later said to me, 'Oh, you're going to meet your mother.' I met a girl friend of brother's at the hospital. She used to invite me over. I felt I couldn't go out with her (the brother's mistress), or my mother. This girl was passionate, and one time sitting on a couch . . . something disgusted me. Later when I called her up, she had a date and then another time she said she found out that my brother was not a gentleman and I told her to go to Hell. When I go out alone it makes me think of a kid the girls tease. He is a regular mamma's boy. I hate to be that way. That idea of mothers being so good, and living off alone somewhere with them is foolish. I think this roomer is a fakir, sometimes he seems all right. I can't stand it to get her off my hands that way. It is hard to think mother would marry him."

Another dream in which a sensation of vertigo is experienced will be included from the eighth interview. It is as follows:

> *"A bunch of fellows were on the street. One fellow was naked and running around. We were all laughing and following him. It seemed that he had an erection. He finally got on a bus and left. I awoke but it seems that I had had another dream or part of this one which had to do with my mother. I felt dizzy and on awakening from this dream I continued to feel dizzy. I was also convinced on awakening that mother was in some way the cause of it or that something about my mother was causing the dizziness."*

The affect-reaction of the dream or dreams are given as "dizziness about my mother, disgust at the sight of the (erect phallus), and amusement on seeing him naked on the street." Concerning the dizziness he said, "I feel that this dizziness is caused by anxiety and worry about my mother and that she is indirectly the cause of it. One day at the office I was smoking a cigarette and a fellow said, 'I guess your mother don't know that you are smoking.' I hate to be considered small. Well, I didn't feel dizzy any more to-day until I got to thinking about this roomer and I got worked up. The blood rushed to my head. If I am calm, I feel all right. If he is friendly and I feel that way, I feel pretty much at ease. He says he likes people who are genial and friendly but I think it is as much his fault. It is so when he behaves as he does, avoids me, etc. Playing cards with mother and I we all felt tense but after playing a while we all felt better. There was a fellow at the office—a sissy—nervous kind of fellow—showed me a picture and said, 'that one is of mamma and me standing under the tree.' It sure sounded funny to me. One day at the desk he fainted and they had to carry him out. He had crying spells and I used to wonder how it felt to feel like that."

The feeling of amusement at the nudity of the dream figure was next considered. He said in part, "Laughing at this fellow. It seemed a joke—funny he should be running around naked. He was a young fellow. Well, I don't know why but when anything is said about girls or intercourse I get worked up. I've often thought I've been inferior to most fellows. I've never been out with a woman that way and I suppose most fellows have." There is a pause and when asked what had come to his mind said, "Disgust, I was thinking of how I felt in the dream—disgust at the boy's running around with (an erect phallus)." He was asked to proceed from this feeling of disgust. "We were all running after him. I have a perfect horror of a c—— s——. When I was going for those treatments (baths), a man next to me brought up the question of women, after which he put his hand on my leg. I put on my clothes and beat it. It seemed, to my mind, abnormal. When I walk along by myself, I get the impression that other fellows would think that I was 'going around by myself.'[3] One night I was watching a game of pool and someone mentioned the word c—— s——. Then I thought that they looked at me. I did have on a flashy necktie. This idea of disgust reminds me of the way I felt with that girl I told I wouldn't see again. I was disgusted at the way I acted toward her. I often hear

[3]A nice remark made also of a girl of easy virtue,—"She goes around by herself," or "she runs around by herself."

fellows my age brag about their intimacies, probably lies . . . as this girl knew my mother I was afraid it would get back to her. She was too passionate and irresponsible. . . . It is disgusting not to get out and mix more with the girls. People appreciate a fellow more if he has girl friends and can go out more and not be confined to boy friends all the time. I feel sometimes that I am handicapped physically, have no ambition and I used to think it would be impossible for me to get married. At the same time, I have a family to support. Yet if mother did get married, I might have some future. If she married somebody I liked, it would be easier."

To return to the dream, we recall that *one fellow was naked and running around* on the street. A bunch of fellows laugh and jeer at this dream figure. That is the way they, his associates, would laugh and jeer at him if they knew the nature of his secret cravings. That is what the naked fellow represents. Then we know how "funny" it seems to the other fellows that he should not have a girl and how they tease and make fun of him. They even say, "He must be going out to meet his mother." As a matter of fact, during the previous hour he remarked that he was much like this "sissy fellow." He has even tried to put himself in the place of this fellow and wondered how it would feel to faint and cry. When the "sissy" referred to a picture and said "that is of mamma and me," it gave our patient a peculiar feeling which he described as "funny." Then at the office a fellow made fun of him, indicating that his mother did not know that he was smoking, that is to say, he was not old enough to smoke. Instead, perhaps, he should have a nipple in his mouth. Too, he hates being considered small, a sissy or a mamma's boy. Quite understandable that he should consider his mother responsible in some way for his dizziness. Actually, it is the strength of the bonds of love for her, which, if running as wild as the nude figure in the dream, would make him an object of derision. We may observe in passing, that the dream figure entered a bus. This fulfills two motives. The bus is something in which one may ride for pleasure and it is also a means of getting away. Entering the bus is first, the fulfillment of incestual cravings—recall the marked manifestations of libido and the statement that all the pleasure that he has had has been through his mother, and secondly, the bus represents a means of escape by way of regression back into the cosmic womb. Now, when such strong barriers exist in the incest notion one might wonder why there should be such a complete turning back if one did not also understand the possibility of another and as equally strong a barrier to going forward, away from the incest taboo. That barrier as re-

vealed is an homosexual one. To use his own expression, he is in a vicious circle—between the devil and the deep blue sea, what with worry over the mother and the roomer, with ensuing dizziness, which makes him think he needs to be operated on for a tumor. The tumor and the operative procedure which he needs is no longer surgical but functional. The homosexual craving seems clear. He has been going around by himself like the girls of easy virtue who go out alone to attract the male. He is looked upon as a sissy, weak and feminine. A boy at the bath placed a hand on his thigh in a suggestive manner. He has a horror of a man who performs sexually upon another man. He must have been suspected once as such an one since he heard a common remark of such people, and the fellow looked at him. Quite self-consciously he noted that he himself was wearing a flashy tie. The secret wish from which he consciously recoils is that, as in the dream boys run after a nude figure, he should be sought after by boys in a sexual way. The feeling of disgust is the equal and opposite reaction toward both the incestual and homosexual cravings. From disgust to symptoms of nausea requires small stretching of the imagination and from confusion over conflicting cravings to dizziness requires, if nothnig else is available, some inner reflection on the feeling of confusion. However, in this adoption of the female rôle an important concatenation of ideas should be mentioned, leading to an understanding of the attitude of the patient to the roomer. He has spoken of the feeling of jealousy, the comparison of the roomer with the father, his own desire for a father who would take an interest in him, his vacillation from ease to a state of tension with the roomer and how in thinking of the roomer he "got worked up"—sexually excited, as was the nude figure in the dream. In this becoming "worked up" over the roomer "blood rushed to his head." This is an important analogy to congestion in general, the idea of a tumor—a swelling in the brain or tumefaction of erectile tissues.

The vasomotor disturbance bears a nice relation to dizziness[4] or fainting spells, either through the "rush of blood to the brain" or its opposite, a "rush of blood" to other parts of the body, *e.g.,* the genital zone. We may now reword a part of the psychological mechanism by saying that, the patient, now realizing that he cannot possess his mother sexually, identifies himself with her and through such adoption of the female rôle diverts the craving from the mother, whose part he plays, to the roomer. The fear that mother may commit some social error may now be seen as a projection of his own

[4] Falling in a dizzy spell or faint bears a nice analogy to a moral fall.

fear of giving in to his own desires. The evolution of the fellatio fantasy is from the rôle of nursling with the mother to an analogous position with the roomer.

Another aspect which merits certain consideration has to do with exhibitionism as displayed by the nude figure in the dream. Exhibitionism, as an overt feature, has been understood as a compensatory manifestation of, sometimes dimly realized, feelings of impotence. In this particular instance, the patient has told us of his lack of ambition, feelings of inferiority, disinterest in calling up any of the girls with whom he is acquainted, ideas of physical handicap and his lack of sexual experience with girls. He has not lacked opportunity. The bungling of a sexual opportunity with his brother's mistress, must have been motivated by rather potent taboos since his own extremely weak rationalization was the fear that his mother might learn of it. A very powerful attraction to and stimulation by this girl was at a critical moment suddenly altered by overwhelming disgust phenomena. Disgust moreover having its origin through homosexuality in the incest craving. This girl was from his viewpoint aggressive, passionate and, from his later remarks, possessed of many masculine traits. As later demonstrated, she was for him a confluent symbol par excellence for the satisfaction of all noncreative libido strivings. It was of interest to learn at the close of this hour that dizzy sensations occurred as a companion manifestation to activity of the erectile tissues. Such occurrences as well as remotely separated nocturnal emissions stimulated disgust. In fact, headache, feelings of increased pressure within or about the head, extreme lassitude, and a confusional attitude toward, and inability to concentrate on his work persisted for some time following a nocturnal emission. He stated that he felt better when he could avoid all sexual stimulation. The idea of suppressing or preventing genital tumefaction, the need for an operation for cerebellar tumor, and the relation of dizziness to both are exceedingly instructive psychological events.

A dream of the eleventh hour dramatizes the nature of his interest in girls.

> *"I was attracted to some extremely pretty girls—my mother said they were unreal; on approaching them I found them to be wax figures. I was then in a dance hall and dancing with this girl I knew I started to kiss her but she turned out to be a fellow I know."*

He said that all girls seemed unreal to him, that French girls are less settled than American girls. These wax figures seemed to be

French. His brother showed him some photographs of very lovely French girls, quite ethereal. The stories his brother told of the diverse methods of sexual pleasure enjoyed by them did not seem to fit in well with such nice pictures. The girl with whom he danced reminded him of the one to whom his brother paid so much attention.

He regrets his lack of opportunity with girls and explains this rather erroneous statement by the statement that he has always been tied down to his mother. He says that he is always comparing girls with his mother. So close a comparison has he made between the mother and the brother's mistress that censorship activity over incest trends connects the object of such poorly disguised behavior as kissing over into that of a male. However, this boy is so easily compared to himself that it is more like a manifestation of love for himself than someone like himself—another male, that the idea of kissing a boy was less offensive than kissing a girl who represents his mother. Still he says, "when the girl changed into a boy it made me feel foolish." The boy reminds him of a youngster that never has a girl and always goes out by himself. This youngster is popular with the fellows as he would like to be; timid so far as the girls are concerned and extremely good looking. He has compared this youngster to himself and has a feeling of sympathy for him, because of what he perceives to be a similarity of difficulties.

The dream of the thirteenth interview points a way out of all of these difficulties. He said:

> *"I dreamed that I was standing by the grave of a man named Free."*

He first recalled a recent trip to his brother's grave and that while standing there he thought that he would be better off if he could be in the grave instead of his brother. Very likely, he might have to be operated upon and this time he might "kick the bucket." "Free" makes him think of being free from worry and responsibility. He would be free if he were dead. Anyway, he might as well be dead since he is as restricted as if he were "buried in a cave." . . . "Home is like a tomb on Sunday." Saturday, he begins to get nervous, tense and dizzy and Sunday things become unbearable. He is brought more into contact with the environment which makes him dizzy and at such times death, he thinks, is much to be desired.

Time does not permit the utilization of further dreams and associational material. Suffice it to say, the patient was enabled through the ecphoria of affect trends to obtain expression of his instinctual interests in a manner not offensive to the ego and more in keeping

with biological aims. Hitherto, he had sought comfort through a conscious denial of the upsurging libido. It was only when he was free from thoughts of a sexual nature that he experienced a feeling of ease. At other times he was tense, ill-at-ease and if the unwelcome emotions came near to crystallization in consciousness, the summation of this vague feeling of dis-ease was experienced as distractibility and confusion up to a pronounced vertigo—even to a panic state. By analogous thinking this alteration from pleasure to pain may be compared to the phenomenology preceding birth which has given form to the Death-Evil preconcept. These feelings of pain experienced by our patient may therefore be seen as radiations of the preconcept of Death. Vertigo has been seen as one of the major radiations in this instance. Dizziness may be observed as a distraction from the painful stimuli in such manner as more obliterative phenomena—fainting, states of unconsciousness, stupors, etc., are seen to function. Death is conceived as a permanent solution of all of these difficulties. However, we must look at this death-wish from an angle which is after all a fear of death. It is not death but comfort which the patient desires. How else can one explain such Herculean tasks as the suppression of that which appears to him as sexual? Such comfort as he has found has been dependent upon a relatively nonsexual point of view, approaching as nearly as possible the Cosmos preconcept. For him the consequences of forward direction of the libido have been decidedly unpleasant. It is the fear of such pain—Death-Evil radiations, which mitigate an investiture of interest in social constructive ends. In this connection, we may remark that it is by means of the phenomenology of the transfer that the patient is assisted from preoccupation with the cosmic mysteries through what is ofttimes so allegorically described as the Valley of the Shadow of Death, dark winding roads and unpleasant journeys to participation in the pleasure substitutes of reality.

THE COLUMNAR ARRANGEMENT OF THE PRIMARY AFFERENT CENTERS IN THE BRAIN-STEM OF MAN *

By Walter Freeman, M.D.

SENIOR MEDICAL OFFICER, ST. ELIZABETHS HOSPITAL, WASHINGTON, D. C.

(*Continued from page 20*)

A. *Exteroceptive System*

(1) Light touch. Fibers for simple touch enter the root zone by the ventral division of the sensory root and run partly to the cornu dorsale within the space of a segment or two, partly directly to the dorsal column nuclei by way of the funiculi. Secondary paths are apparently widely distributed in the spinal cord for they are said not to be destroyed except in very extensive lesions. It is possible that impressions of light touch reach the higher centers by a number of relays.[1]

The discriminative elements of touch sensation, such as the recognition of the size or shape of the object placed upon the skin, the texture and the hardness, are probably carried entirely by fibers running in the dorsal columns.

The cutaneous fibers subserving the function of touch (pressure touch?), whose secondary course we find later represented in the spinothalamic tract of the opposite side, enter in the ventral division of the sensory root. According to Winkler, they divide immediately into short descending branches and slightly longer ascending ones. These form a fine meshwork dorsal to the substantia gelatinosa Rolandi, and after passing around or through the stratum gelatinosum go to make up another fine meshwork on the inner side. The tactile fibers apparently run to the cellulae limitantes of the dorsal horn where the impulses are then relayed to the higher centers by way of the opposite spinothalamic tract. As was noted above, Winkler believes

[1] In examining for the sense of light touch it must be remembered that the touch of the finger or even of a light brush will often stimulate the deep nerve endings. The need for delicacy in the examination for light touch was shown by Head (7) upon his own arm. He also showed that the movements of the hairs stimulated the deep sensory endings, for these movements were perceived as touches in a part of the arm that had been rendered otherwise anesthetic by section of all the nerves supplying cutaneous sensibility to that part. Shaving the arm removed the interference. To gain an idea of the proper stimulus to be used in testing the sense of light touch, the glans penis offers a normal control. Head and others have shown that light touch is not perceived on the glans penis.

that fibers transmitting light touch may travel in a number of different paths, and by several relays. Head (7, p. 401) states that tactile impulses are gradually filtered off on their way up the cord from the side of entry to the opposite side. When tactile sensibility is lost in Brown-Séquard paralysis, it is lost on the side of the body opposite the lesion, but it is lost only when the lesion is high up in the cord.

(2) Pain and temperature sensations are transmitted together as a general rule, although in some clinical cases there is dissociation of sensation, heat being perceived and cold not, or pain perceived and not temperature. In general, however, it seems that the fibers transmitting these impressions enter in the ventral division of the sensory root, run up and down for a limited distance in the tract of Lissauer, and find their end stations in the dorsal horn within two segments of their level of entry. The entering fibers seem to connect with the small cells of Gierke, by which the impressions are relayed to the cellulae limitantes and thus by way of the opposite spinothalamic tract to the brain. In either case the primary end stations for the fibers conveying pain and temperature sensations are to be found in the dorsal horn close to the level of their entry.

(3) Pressure sensations, although conveyed by fibers in the motor divisions of the spinal nerves, are transmitted to the spinal cord by way of the dorsal root and are probably relayed cephalad by cells in the dorsal cornu as well as carried directly by the primary fibers running in the dorsal funiculi to the nuclei of Goll and Burdach. In addition a series of short paths seems to be open to pressure impressions, by which they may be relayed to the brain. Only very extensive lesions of both halves of the spinal cord will abolish the sense of deep pressure.

(4) Fibers subserving segmental reflexes and muscle tone probably enter by the ventral division of the sensory root and run directly to the ventral horn on the same side.

B. *Interoceptive System*

The afferent impressions from the viscera are carried by fine fibers, presumably in the dorsal division of the sensory root, and find their end stations in the pars intermedia in close relation with the cells of origin of the visceral efferent system.

C. *Proprioceptive System*

Kinesthetic impressions, like those of deep pressure, are apparently conveyed from the end organs in the muscles, joints, and tendons by heavy fibers which enter in the dorsal division of the sensory root.

Two paths are open, one towards the cerebrum and one towards the cerebellum. The former path is found in the dorsal columns and their nuclei, and subserves the cognitive aspect of proprioceptive sensibility. The latter is by way of the cells of the column of Clarke, which forms their primary end station, to the cerebellum, and subserves the automatic postural aspect of proprioceptive sensibility. Deep pressure sense, including the sense of vibration, is probably transmitted by the proprioceptive cognitive system, and has been considered apart, with the exteroceptive system, only for the sake of convenience. Both systems belong to the somatic sensory system.

The Entering Root Fibers of the Cranial Nerves

The usual description accorded the roots of the VII, IX, and X nerves is that the motor fibers lie mesially and the sensory ones laterally, and that they enter the brain stem in a number of fasciculi lying one above the other. There has been no attempt to analyze further the different fasciculi of the afferent roots. Using the dorsal root fibers of the spinal cord as our example, let us see whether this analysis is facilitated. In the spinal cord, according to Winkler, each entering sensory root is divided into a smaller ventral portion and a larger dorsal one. If the cranial nerves are examined it will be found that the relationship is usually the same, but by no means constantly so. For instance, the two divisions of the N. glossopharyngeus are of about equal size. The dorsal divisions of the sensory roots of the N. vagus are multiple; sometimes as many as five strands may be seen penetrating the zona radicularis in the same section. The dorsal branches are always the larger. In the case of the N. trigeminus the relationships are complicated, as we shall see later by the fact that the nucleus sensibilis trigemini and the radix spinalis trigemini receive divisions of the same entering fibers. Also in the case of the lower branchial nerves the picture is often obscured by the entrance of several afferent fasciculi one above the other, but this arrangement does not disturb essentially the dorsoventral relationships of one to another.

What is the destination of these various fasciculi? In the spinal cord, as we have seen, the smaller ventral division of the sensory root, carrying principally impressions of pain and temperature (and according to Winkler, touch), runs in the zone of Lissauer and enters the substantia gelatinosa Rolandi. The larger dorsal division of the sensory root gives its fibers to the dorsal columns, to the column of Clarke, and to the pars intermedia. The most dorsal fractions enter the column of Clarke and the pars intermedia, the central fractions

go to the dorsal funiculi, and those situated in proximity to or within the ventral division run to the anterior horn as segmental reflex fibers.

FIGURE 6. Pons of adult man, showing details of the entry of the sensory division of the N. facialis. To the outer side of the R. spin. trigemini (V s) are seen the entering root fibers of the N. vestibularis. Penetrating the spinal root are numerous fasciculi of the sensory division of the N. facialis. Some of the fibers apparently join the R. spinalis V, others continue dorsomesiad to reach the viscerosensory nucleus A which is capped by the tractus solitarius. Medially to this a large fasciculus can be seen which runs farther dorsad and then bends proximad. The R. motoria VII is seen on the lower right. Outline shows the area selected.

In a general way the same arrangement is found to hold good in the brain stem.

Some of the dorsally placed fasciculi of the IX and X nerves

penetrate into the radix spinalis trigemini and apparently do not emerge. The probability is that they turn caudad in this cephalic prolongation of the tract of Lissauer, a hypothesis that is confirmed by Cajal's researches. The ventral fibers of the main sensory divisions of the N. trigeminus bend caudad in the R. spinalis V, thus forming the tract at its commencement. In the case of the N. facialis the relationship is apparently somewhat different. A large number of small bundles making up the ventral division of the sensory root enter and lose themselves in the spinal root of the trigeminus, but ventral

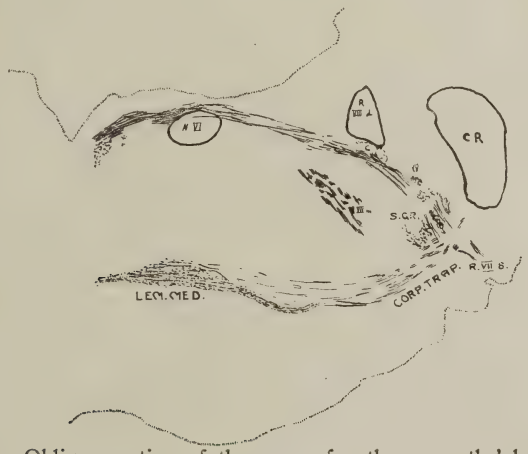


FIGURE 7. Oblique section of the pons of a three months' human embryo stained with silver (author's method). The entering fasciculi of the R. sensibilis N. VII are seen penetrating the R. spin. N. V and running partly to the tractus solitarius at c. and partly mesial to this. They can be traced in a very definite series of strands to the neighborhood of the VI nucleus where they engage the R. motoria N. VII.

to them all is a relatively large fasciculus that penetrates the R. spinalis V, and runs dorsomesiad without apparently giving off any fibers to the tract. This fasciculus may have crossed the other roots to attain its position but I was unable to determine it in any of the series. The fibers entering the R. spinalis trigemini in all probability carry pain and temperature sensations to the nuclei accompanying the root. It is very doubtful if even simple tactile impulses are relayed by the substantia gelatinosa N. trigemini. (See Cases 2 and 3.)

The fasciculus of fibers which formed such a prominent part of the sensory root of the N. facialis is also represented in the sensory roots of the IX and X nerves, but here the fasciculi were found to be situated centrally among the entering fibers. Fig. 6 shows this fasciculus belonging to the N. facialis. Reaching the position shown, to the mesial side of the tractus solitarius, the fibers bend forward

and come into close relationship with the distal portion of the radix motoria N. VII (Fig. 8). In a fortunate preparation giving an oblique section of the brain stem of a human embryo, these fibers could be traced almost to the midline at the level of the genu N. facialis dorsal to the nucleus abducens (Fig. 7). (See also Appendix A.) It is probable that they continued their course in conjunction with the proximal portion of the radix motoria N. VII to end in the

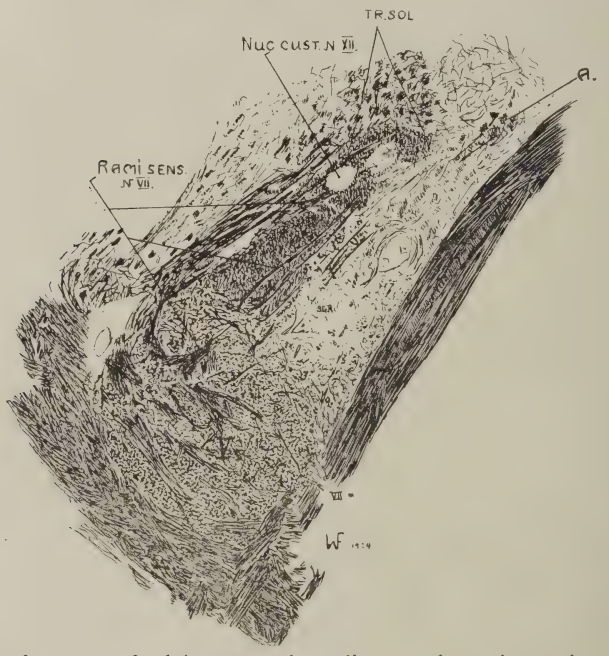


FIGURE 8. Pons of adult man a short distance above the section shown in FIG. 6; showing the R. sens. N. VII engaging its gustatory nucleus. This gelatinous nucleus is situated in the course of the incoming fibers somewhat ventrolateral to the N. viscerosensibilis of the tractus solitarius. The full stretch of the R. motoria VII is seen. The mesial bundle of segmental reflex fibers which entered at a lower level may be seen in its vicinity as a loose bundle of fibers cut transversely (A).

motor nucleus of the facial nerve. Homologous fibers belonging to the IX and X nerves can be seen in some other sections (Figs. 9, 10, 15), lying to the inner side of the tractus solitarius at the margin of the central gray matter. These fibers are probably those subserving segmental reflexes. Of their afferent nature we have no certain proof. The peripheral course is with the afferent roots, however, and there are homologous fibers in the spinal cord. Van Gehuchten (27) considered the bundle to be an aberrant fasciculus of the motor portion.

Of the dorsally placed sensory divisions, the most mesial usually

bends laterally, crossing the divisions situated farther dorsally, and runs in the direction of the corpus restiforme. In the case of the spinal nerves, the corresponding fasciculus is destined for the dorsal funiculi. In the brain stem, however, instead of the dorsal columns we have the main sensory nuclei, and it is apparently to these collections of cells that these fibers pursue their course. The nucleus sensibilis trigemini is the best known of these groups and is homologous with the nuclei of the dorsal funiculi. The other nuclei will be described below. The fibers concerned probably carry superficial and deep discriminative sensibility.

FIGURE 9. Medulla oblongata of 6 months' human fetus (silver impregnation). The division of the entering root fasciculi can be seen clearly. Fibers from both divisions of the afferent root turn outward and run in the direction of the collection of large cells at the tip of the corpus restiforme. A large mesial strand enters the R. spinalis V and apparently joins it in its caudad course. The dorsal afferent fasciculus engages a large pyriform gelatinous nucleus (Nuc. gustativus IX) and the Nuc. viscerosensibilis IX of the tractus solitarius. At "A" there are apparently some root fibers joining the R. desc. VIII.

The large dorsal division of the afferent root often consists of several subdivisions, and not infrequently they do not penetrate the R. spinalis trigemini but skirt its dorsolateral border. This is especially true of the N. vagus. In the case of the seventh and ninth nerves this division engages nuclei that are believed to be the gustatory nuclei, and in part this division runs farther dorsomesiad to make up the fasciculus solitarius (Figs. 8 and 9). In the case of the vague nerve it runs largely to the tractus solitarius with its accom-

panying nuclei (Fig. 10). No collections of ganglion cells could be identified as the nucleus gustativus X. The fibers taking this course are those conveying interoceptive impressions, general sensibility from the mucous membranes, and special sense (taste) from the tastebuds.

Between the entry of the sensory root of the N. facialis and that of the lower entering fasciculi of the N. vagus the tractus solitarius lies in such intimate relation with the radix descendens VIII that no

FIGURE 10. Medulla oblongata of a 6 months' human fetus stained with silver, showing the entering root fibers of the upper portion of the N. X. A few strands run in the direction of a collection of large cells near the tip of the corpus restiforme. Another fasciculus apparently joins the R. spin. V at b. Most of the fibers run to the tractus solitarius and its accompanying nucleus. A few motor fibers are seen. SGR = substantia gelatinosa Rolandi. OC = fibrae olivo-cerebellares.

adequate separation can be made, and indeed it seems that some strands from the most dorsal division of the various afferent roots penetrate among the descending fibers of this tract and lose themselves there. These fibers will be considered later when the great proprioceptive system of the brain stem is described, the vestibular nerve and its centers.

The interoceptive fibers of the N. trigeminus enter upon the outer or dorsal side of the sensory root, and run to the visceral sensory center which is the forward continuation of the tractus solitarius (Fig. 11).

The known proprioceptive fibers of the N. trigeminus occupy a different position from those in the spinal nerves possibly because

they enter the neural axis in primitive fashion without preliminary relay in the Gasserian ganglion. At their entry into the pons, therefore, these fibers lie on the inner or ventral side of the main sensory root. They can be traced as heavy fibers running far dorsally between the motor and sensory nuclei of the fifth nerve, and close to the lateral wall of the fourth ventricle, where they form the radix mesencephalica trigemini (Fig. 12).

FIGURE 11. Pons of adult man, showing fibers situated in the lateral portion of the entering R. sens. V, running to the cephalic continuation of the tractus solitarius, the viscerosensory column. This nucleus is considerably larger than it was at lower levels, and is surrounded by large number of fine fibers. BP = brachium pontis.

III. The Primary Receiving Centers

The Location of the Sensory Columns

The entering fasciculi of the sensory roots in the brain-stem upon analysis are found to correspond more or less closely with the dorsal roots in the spinal cord. The ventral division of the dorsal root carries cutaneous fibers while the dorsal division carries interoceptive,

proprioceptive, and segmental reflex fibers. We now take under consideration the arrangement of the reception nuclei for these various fibers, and as in the previous chapter, the model presented is the spinal cord.

In the spinal cord the segments are arranged one above another in an orderly manner and resemble each other to a certain degree, so that it is partly by a study of the differences of architecture at different levels, always keeping in mind the specific functions known to be

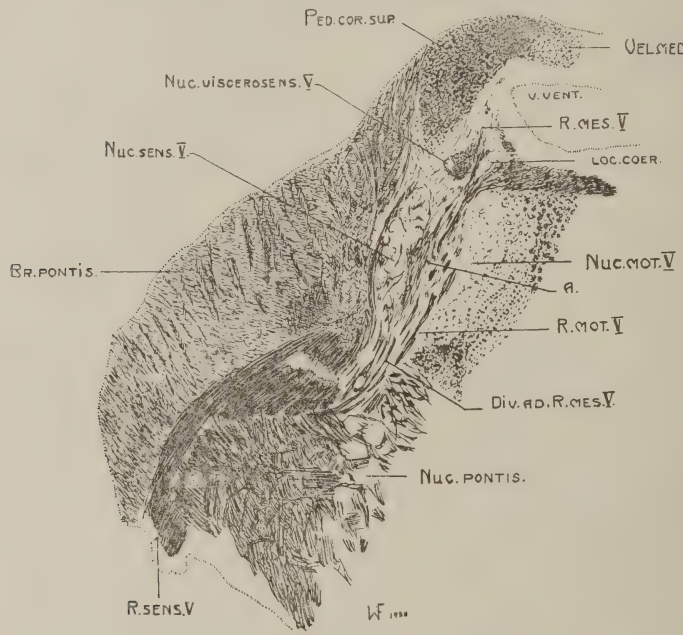


FIGURE 12. Pons of adult man, showing roots and nuclei of V nerve. Section somewhat above the level of the last. The sensory and motor nuclei are well developed. Between them run several strands of heavy fibers that come in with the sensory root. At the level of the apex of the nucleus motorius V they divide, some going dorsad to form the R. mesencephalica V, some mesiad, and others to the locus coeruleus. Almost in contact with the R. mesencephalica is the proximal end of the N. viscerosensibilis V, the forward termination of the tractus solitarius. This is a small gelatinous nucleus surrounded by a large number of fine fibers. Some sensory ganglion cells of the radix mesencephalica are seen at A.

exercised by these segments, that we arrive at a conception of the meaning of the different grouping of the cells in various parts of the gray matter. This in itself has led to the study of the spinal cord from the point of view of the column. The segments have received some consideration, especially where the diagnostic value of level symptoms is considered, but the individual nerves and their centers

receive but scanty consideration—they are in general too much alike. The anatomy of the cord may be expressed as that of the segment and the column rather than that of the nerve. In the brain-stem it has been otherwise. The individual nerves have from the first received individual attention. They are considered as individuals. Resemblances of one to the other have been kept in mind, and for some time past their segmental value has been understood, but in man as yet no general attempt has been made to apply to the brain-stem the doctrine of the columnar arrangement of the primary receiving centers. By the recognition of this columnar arrangement I believe

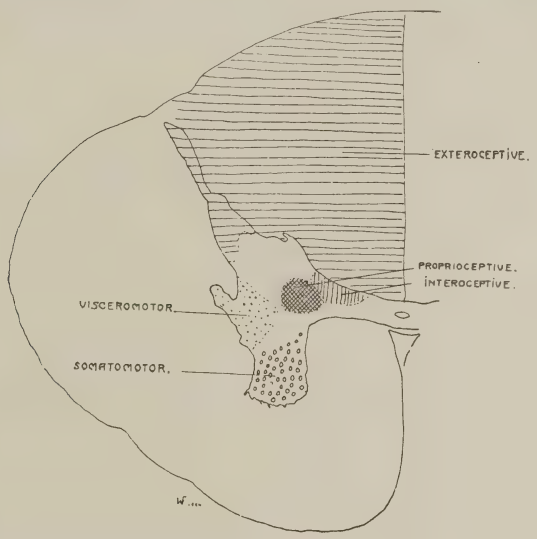


FIGURE 13. Semischematic outline of the columnar arrangement of the primary afferent fibers and centers in the spinal cord of man. Level about IV thoracic. Exteroceptive (and proprioceptive cognitive) horizontal shading; the funiculus dorsalis and cornu dorsale. Interoceptive vertical shading; the pars intermedia or nucleus parapendymalis. Proprioceptive crossed shading; Clarke's column. Visceromotor dots; cornu laterale. Somatomotor circles; cornu ventrale.

we shall arrive at a clear understanding of the fundamental anatomical groups upon which this portion of the central nervous system is constructed. In military formations the rank and the file must be considered rather than the individual soldier. We must treat the brain-stem similarly by considering the segment and the column rather than the individual nerve.

It was shown at some length in the first chapter that each of the cranial nerves under consideration (the V, VII, IX, and X), contains all the components that go to make up a spinal nerve, and that the

only differences are of degree, one component of one nerve being greater than that of another, and another component smaller. With the exception of the special senses all the components are represented in each nerve. Since this is so, we should be able to find in the medulla oblongata, and in the pons as well, certain primary reception centers which maintain a similar relationship to one another and to the relationship that exists in the spinal cord.

In constructing diagrams of the relationships of the various centers in the medulla oblongata it is well to choose the thoracic portion of the spinal cord as a model, for in both instances the interoceptive and proprioceptive components are relatively more highly developed than

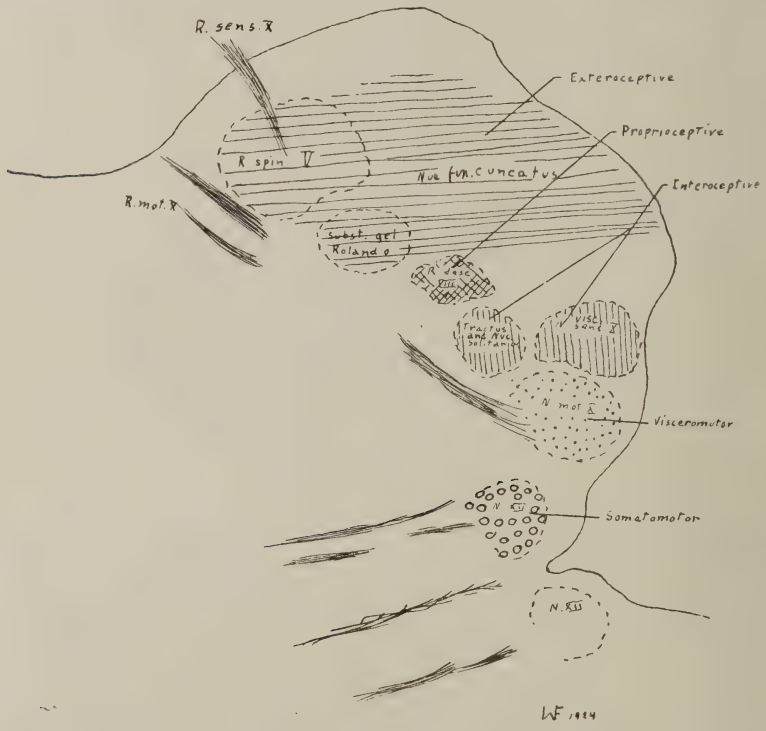


FIGURE 14. Semischematic section of the medulla oblongata, showing the X and XII nuclei. The section has been rotated in order to bring the entering roots into the same relative position as is found in the spinal cord. Corresponding to the dorsal cornu we find the R. spin. V and its substantia gelatinosa. The dorsal column finds its Nuc. funiculi cuneati at this level. The exteroceptive system is shaded in horizontal lines. The interoceptive system is represented by the tractus solitarius with its attendant nuclei, and the Nuc. viscerosensibilis X. It is shaded with vertical lines. The proprioceptive system (R. desc. VIII) from the vestibular nerve is shaded in crossed lines. Visceral motor and somatic motor systems are represented by the motor nuclei of the vagus and hypoglossus, distinguished by dots and circles respectively.

are the exteroceptive components. For general orientation also I refer back to Fig. 1, in which the simplest relationships, as they occur in Scyllium, are to be found.

In the thoracic portion of the spinal cord (Fig. 13) it will be seen that the sequence of areas commencing at the dorsal septum, and omitting from consideration all secondary and descending tracts, is:

1. Exteroceptive (dorsal column and dorsal horn).
2. Proprioceptive (dorsal column and Clarke's column).
3. Interoceptive (pars intermedia or nucleus paraependymalis).
4. Visceromotor (cornu laterale).
5. Somatomotor (cornu ventrale).

Let us now apply this method of division to the medulla oblongata, taking a level showing the nuclei of the tenth and twelfth nerves (Fig. 14). The ventral fissure is replaced by the raphe against which lies the somatic motor nucleus of the N. hypoglossus. External to this is the dorsal motor nucleus of the N. vagus. The unfolding of the medulla oblongata that accompanies the opening of the central canal into the fourth ventricle has placed the primary centers in a more or less horizontal row along the floor of the ventricle, but by looking at the section rotated so as to bring the entering nerve roots into analogous positions to those seen in the spinal cord it is easier to trace the resemblance. External to the visceromotor column (the dorsal motor nucleus of the N. vagus) lies the interoceptive or viscerosensory column represented by the Nuc. sensibilis vagi, the Nuc. rotundus vagi, and the Nuc. tractus solitarii. Farther externally come the proprioceptive centers as represented by the descending root of the eighth nerve, and at the surface the nucleus funiculi cuneati and the R. spinalis trigemini belonging to the exteroceptive system.

The relationships as they exist at the level of the primary reception nuclei of the N. acusticus will be considered later (see also Fig. 21).

Farther proximal, where the primary receiving centers of the N. trigeminus are situated, the relationships are again slightly different. As I have already pointed out, the afferent proprioceptive fibers of this nerve enter with the sensory root without preliminary relay in the gasserian ganglion, and they run ventrally to the other entering fibers of the main sensory root. Likewise the primary receiving station for these fibers, the R. mesencephalica trigemini, is at this point found closer to the ventricle than is the Nucleus viscerosensibilis N. V. This is shown in Fig. 12, and is also indicated in the semischematic diagram Fig. 15. An explanation for this is attempted below.

This study deals with the sensory or afferent primary fibers in the brain-stem of man. It is limited in its scope to the mixed nerves of branchial origin, but some side facts are noted which give promise of clarifying the distribution of the other primary afferent fibers which come into more or less intimate relation with the foregoing. As I have indicated, I shall take up the study from the point of view of the column rather than of the individual nerve.

The columns are in principle three, the exteroceptive, the interoceptive, and the proprioceptive.

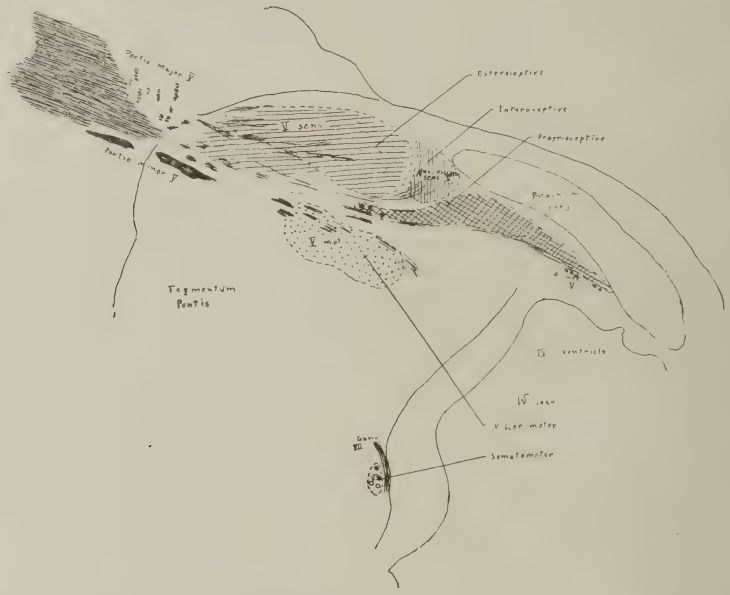


FIGURE 15. Semidiagrammatic cross section of the pons at the level of entry of the fifth nerve, showing the disposition of the primary neurones. 1. Exteroceptive in horizontal shading; 2. Interoceptive in vertical shading; 3. Proprioceptive in crossed shading; 4. Visceromotor in dots; 5. Somatomotor in circles. The relationships of the interoceptive and proprioceptive columns is altered. See text. The section has been rotated to conform more to the direction of the entering dorsal roots in the spinal cord.

A. *The Exteroceptive Column*

In drawing our analogy between the columnar structure of the spinal cord and that of the brain-stem, we found that the exteroceptive column occupied the most dorsal portion of the spinal cord and the most lateral portion of the medulla oblongata. In the cord it is represented by the dorsal columns with their nuclei of Goll and Burdach at the top, and by the dorsal cornu. It is in the substantia

gelatinosa Rolandi and the dorsal column nuclei that the cutaneous afferent fibers find their end-stations. The secondary tracts that relay impulses in a cephalad direction commence here. In a general way it may be said that pain, temperature, and a few tactile impulses are relayed from the substantia gelatinosa, and that tactile and discriminating impulses (for localization, discrimination of two points, etc.) travel in the dorsal columns and are relayed from the nuclei of these dorsal funiculi.

FIGURE 16. Brain-stem of 6 months' human fetus at the level of the cochlear division of the N. VIII. The motor and sensory roots of the N. VII are seen outside the bulb. The Nuc. ventralis VIII is fairly well developed but the tuberculum acusticum is immature. At the tip of the corpus restiforme is a small compact group of large cells of the type found in the Nuc. sensibilis V. It lies in the same relative position as that occupied by the upper pole of the Nuc. cuneatus. It is thought to be the Nuc. sensibilis VII where one division of the cutaneous and proprioceptive fibers ends. The interoceptive column is represented by the prevagal portion of the tractus solitarius in the angle between the substantia gelatinosa Rolandi and the R. desc. VIII. The separation between the two portions of the exteroceptive division (the R. spinalis V and the Nuc. sens. VII) is probably due to the large mass of fibers of the N. vestibularis which enters at a slightly proximal level.

In the brain-stem the tract of Lissauer is represented by the so-called Radix spinalis trigemini, and the substantia gelatinosa Rolandi by the substance of the same structure and the same name

that is found in the brain-stem. Nothing is more firmly established than the homology and direct continuation of the substantia gelatinosa Rolandi in the spinal cord and in the brain-stem. There are certain superficial modifications that have taken place in this oral prolongation of the tract of Lissauer, for instance the greater distance to which the component fibers run caudad in it, but the modifications are due to the principle mentioned before of usurpation and are superficial only. The underlying more fundamental structures have retained their primitive character. We shall discuss them shortly.

Fiber tracts homologous with the dorsal funiculi do not exist in the brain-stem. The homologous fibers from the cranial nerve ganglia, the ganglion semilunare, ganglion geniculi, etc., end practically at their level of entry into the brain-stem. For instance, the nucleus sensibilis trigemini receives one part of the cutaneous fibers of the N. trigeminus. Its structure is the same as that of the dorsal column nuclei. Its cells are practically identical in size and morphology, and moreover they undergo secondary atrophy after lesions of the ventral nucleus of the thalamus, lesions which cause retrograde atrophy of the lemniscus medialis and its cells of origin in Goll and Burdach's nuclei. Winkler has made a special study of this condition and has even designated a trigeminal fillet with a termination more mesial in the thalamus than the termination of the great band of sensory fibers in the mesial lemniscus.

If we take the nucleus funiculi cuneati and the nucleus sensibilis trigemini as examples of the exteroceptive primary centers (leaving aside for the moment the proprioceptive cognitive function that they undoubtedly exercise), we may locate them with respect to the structures that surround them and thus determine the position of the exteroceptive column. Then we may attempt to find the corresponding nuclei for the seventh, ninth, and tenth nerves.

At its proximal end the nucleus funiculi cuneati consists of a small group of large cells situated close to and mesial to the dorsal tip of the corpus restiforme, and lateral to the descending root of the vestibular nerve. It is somewhat separated from the Radix spinalis trigemini. This forms the caudal landmark of the almost vanished exteroceptive column. The rostral landmark is formed by the caudal tip of the Nuc. sensibilis trigemini. This is found dorsal to the fibrae transverse pontis, and on the mesial border of the corpus restiforme which at this level is diverging toward the cerebellum. It is in the same relative location that we must look for the sensory nuclei of the seventh, ninth, and tenth nerves.

At the level where the sensory division of the N. glossopharyngeus

enters the medulla oblongata there appears on the inner side of the tip of the corpus restiforme, and external to the radix descendens N. vestibuli, a group of large multipolar cells. This group is located in precisely the same place as the proximal tip of the N. cuneatus and is separated from it in the longitudinal axis by only a fraction of a millimeter (in the six months' fetus). It is as much a continuous structure in the brain-stem as is the Nuc. ambiguus. From appearances in the fetus it seems that the entering fibers from the ventral sensory root of the glossopharyngeus bend laterally and run dorsally toward the corpus restiforme (Fig. 9). In the relatively immature brain that I have studied by means of silver impregnation of serial sections, the root fibers stand out in prominent contrast to the surrounding pale groundwork, and they appear to run to the vicinity of the nucleus mentioned. Other investigators, notably Winkler, have described radicular fibers in this nerve which run laterally from the main trunk in the direction of the cerebellum, but it appears relatively certain that in man no radicular fibers run directly to the cerebellum. This nucleus, then, whose cells are large, occupies the same relative position as does the nucleus cuneatus. I believe it functions as the nucleus sensibilis glossopharyngei. This small collection of cells is difficult if not impossible to locate in sections from the adult brain-stem stained by Weigert's method. The Nissl stain, however, shows the cells in this location, and the group in the fetal brain is quite evident.

The great entering mass of octavus fibers renders the location of the homologous nucleus for the seventh nerve even more difficult. The entering fibers of the dorsal division of the sensory root of the N. facialis pursue an oblique course from behind forward in reaching their interoceptive nuclei. Some of the fibers of the ventral sensory root however, apparently take an oblique course in the caudal direction to reach their exteroceptive nucleus. By close examination of the region lying between the dorsal tip of the corpus restiforme and the radix descendens nervi vestibuli, I have found a small compact group of large cells situated at the level of entry of the cochlear division of the N. octavus (Fig. 16). It is impossible in my preparations to trace the entering fibers of the sensory division of the N. facialis to their termination in this nucleus, but at the level of entry there is an aberrant strand of radicular fibers that runs in the direction of the restiform body. Appearances are suggestive, the location of the nucleus is identical with the former, and the cells show the same degree of development as do those of the known exteroceptive nuclei. Further investigations are necessary to establish the function

of this nucleus as the receiving station for the cutaneous fibers of the facial nerve. The same difficulties in distinguishing this nucleus are encountered in Weigert sections from the adult as in the case of the Nuc. sensibilis IX. For a study of the afferent division of the N. facialis in the elephant see Appendix A.

Throughout practically the whole space of entry of the numerous roots of the vagus nerve the nucleus funiculi cuneati is present. This

FIGURE 17. Medulla oblongata of 6 months' fetus stained with silver. The tractus solitarius of the interoceptive column stands out prominently, surrounded by a gelatinous nucleus, the N. interstitialis of Cajal, and bordered dorsally by the G. descendens to which it gives many fibers of fine caliber. Laterally to it is the so-called N. ventralis tractus solitarii which is seen to be in relation rather with the N. cuneatus than with the T. solitarius. It is found to the outer side of the proprioceptive column as represented by the R. desc. VIII. The N. ventralis T. solitarii is taken to be the exteroceptive reception nucleus for the primary cutaneous fibers of the N. X.

nucleus grows progressively smaller and in its upper portion it has ceased visibly to receive any fibers from the funiculus cuneatus which has terminated some distance below. It is possible that the long forward projecting tongue of nucleus is the receiving station for cutaneous fibers of the N. vagus rather than for fibers running in the funiculus cuneatus. There is however another collection of cells to be considered.

In close relationship with the nucleus funiculi cuneati, at a level where there are still some fibers of the funiculus cuneatus to be seen, there is an interrupted column of cells of the same type lying more or less ventrolaterally from the prominent tractus solitarius. This is probably the nucleus ventralis tractus solitarii which is described by von Monakow (70) as follows: "In the substantia gelatinosa of the tractus solitarius are scattered (besides small and minute typical elements of the substantia gelatinosa) larger multipolar and spindle cells which are assembled in a little group ventral to the tractus solitarius. In the neighborhood of Burdach's nucleus and the cell mass of the substantia gelatinosa Rolandi the groups become more scattered, cells lying singly or in pairs. Many of these examples lie rather deep in the formatio reticularis, where they are again assembled." According to Winkler the tractus solitarius is surrounded on all sides by arcuate fibers which leave open only the ventrolateral aspect. In this location he finds the large cells of the nucleus ventralis. Cajal (2) does not include this nucleus among those of the tractus solitarius Kohnstamn and Wolfstein called it the Nuc. parasolitarius. By reference to Fig. 17 which is a drawing of the medulla oblongata of a six month's fetus, there is seen a compact group of fairly large cells situated laterally or ventrolaterally with respect to the tractus solitarius. This was the best example I could find in this particular series of a collection of large cells ventral to the tractus solitarius. As will be seen however, this nucleus lies some little distance from the gelatinous nucleus (with the small elements), that lies strictly on the ventral surface of the tract. Moreover the nucleus of large cells lies in fairly intimate relationship with the Nucleus funiculi cuneati and to the *outer* side of the R. desc. VIII. It lies in the path of some of the lower entering fasciculi of the N. vagus though none of the fibers can be seen to lose themselves among the cells. These cells of the Nucleus parasolitarius or the so-called Nuc. ventralis tractus solitarii, according to Tumbelaka and to Winkler, undergo atrophy in cases of thalamic softening, so that they belong to the lemniscus system. This nucleus, then, is probably the primary receiving station for the exteroceptive fibers of the N. vagus. The long cephalic prolongation of the Nucleus funiculi cuneati may be a continuation of the Nucleus ventralis tractus solitarii rather than the Nuc. fun. cuneati proper. At the level of entry of the proximal roots of the N. vagus, I could find no Nucleus ventralis tractus solitarii.

The bulbar portion of the exteroceptive column, homologous with the nuclei of the dorsal funiculi of the spinal cord therefore lies between the radix descendens nervi vestibuli and the corpus resti-

forme. Its several parts, in relation to the nerves it supplies, are the proximal portion of the Nucleus funiculi cuneati, the Nucleus ventralis tractus solitarii, the Nucleus sensibilis glossopharyngei, the Nucleus sensibilis facialis, and above, the Nucleus sens. trigemini.

These nuclei relay several forms of sensation, superficial and deep, that might be classed together as discriminative in the spatial sense of the term.[1]

The trigeminus system offers one of the best fields for the study of the repartition of sensory impulses, because the main sensory nucleus may be preserved while the spinal root is injured, or vice versa, the main sensory nucleus may be damaged leaving the spinal root apparently wholly intact.

Disease of the spinal root of the trigeminus causing a syringomyelic dissociation of sensation in the face is discussed in the following section, but I can present here two cases showing the inverse syringomyelic dissociation, that is, preservation of pain and temperatus sensation with the abolition of touch sensation. In neither case was there a necropsy to confirm the clinical findings, but the inference is fairly conclusive from the clinical examination that the Nucleus sensibilis trigemini was destroyed. The first case was reported by Spiller (59).

Case 2. (Reported by Spiller.)

"The case was supposed to be one of multiple sclerosis. The symptoms which are of interest as regards sensation are as follows: The man had entire loss of sensation for heat, cold and pain on the entire right side of the body including the face as well as the limbs. He had slight impairment of sensation for heat but not for cold over the left forehead. Tactile sensation was entirely normal over the entire right side in the parts in which temperature and pain sensations were lost, and sense of position was promptly recognized in the right hand. Tactile sensation was entirely lost in the left side of the face but only in the distribution of the fifth nerve; pain and temperature sensations were normal in this region excepting for slight impairment of heat sensation in the left forehead. The tactile loss did not extend over the scalp behind a line

[1] This is not epicritic sensibility in the sense that Head used the term. The dissociation of protopathic and epicritic sensibility occurs only at the periphery and the distinction grows less and less marked even in the peripheral nerves as the dorsal roots are approached. In the central nervous system there is a repartition of paths by which impulses travel, and reintegration again at higher levels. For instance in regard to temperature sensation, a lesion at the periphery abolishing epicritic sensibility will prevent the perception of small differences of temperature, while the extremes of heat and cold will be felt correctly. In the spinal cord a lesion that interferes with temperature sensation will interfere with the extreme differences nearly as much as with the slight ones. Moreover thermic sense may be abolished in spinal lesions leaving tactile sensibility wholly unimpaired.

drawn vertically to the ear, or into the distribution of the cervical nerves on the left chin. Deep pressure was felt below the left eye, but it was not felt above the left eye. When the mouth was opened the jaw deviated markedly to the left. The left temporal and masseter muscles were paralyzed."

"It seems probable that the lesion in this case was in the left tegmentum of the pons. It implicated the central fibers of pain and temperature sensations coming from the entire right side of the body."

In addition there was paralysis of the left external rectus muscle, and other signs of multiple sclerosis. The full report of the case appears in Review of Neurology and Psychiatry, February 1910.

A second case of inverse syringomyelic dissociation of sensation in the face has recently been studied by me in the Reale Clinica delle Malattie nervose e mentali, Professor G. Mingazzini, Rome, to whom I am indebted for permission to report the case.

Case 3. A. L., male, aged fifty years. Diagnosis: multiple sclerosis.

In December 1923 the patient noted weakness of the legs, staggering gait and an impediment in his speech. Shortly afterward he suffered from regurgitation of fluids through the nose, dysphagia and sialorrhea. At one time he had diplopia. Examination disclosed nystagmus, scanning speech and intention tremor, exaggeration of patellar reflexes, and abolition of abdominal and cremasteric reflexes. Examination of the cranial nerves showed the senses of smell and sight intact. The eyeball was moved freely and equally in all directions, but with nystagmus, especially in looking to the left. Pupillary reactions were normal to light and to distance.

V. Touch. There was anesthesia to light touch over the whole left side of the face as shown in Fig. 18. The patient could not distinguish the size or shape of an object that touched his cheek, forehead or lips. For instance he frequently confused the dull point of a pencil with the examiner's finger. He could not distinguish between a marble, a ring and a cube. He could not tell the difference between silk and wool when they touched his lips, or between glass and leather. He could not discriminate between the touches of one and two points of the compass, even when they were separated a distance of 15 to 20 mm. All these reactions were carried out with facility on the right side of the face.

In order to estimate more accurately the threshold of cutaneous sensibility a series of tactile hairs was constructed and calibrated. Von Frey's directions for estimating the tension strength of the hairs were followed. To arrive at this figure the bending strength of the hair is measured on a fine balance, and then the thickness of the hair is measured in its two diameters. The area of the elliptical cross-section is then calculated, but the number used is the radius of a circle of the same area as the cross-section of the hair under consideration. The pressure in milligrams required to bend the hair is then divided by radius of the

circle as calculated, and the figure obtained, expressed in grams per millimeter, is the *tension strength* of the hair.

On the right side of the face the patient could feel a hair of 9 grm./mm. (18 mg. bending strength) on his cheek, lip, and a side of the nose and conjunctiva. A hair of 10.8 grm./mm. (45 mg. bending strength) tension was felt on the right side everywhere. On the left side, touches with these hairs upon the skin were nowhere appreciated within the area outlined. The hair with a tension of 43 grm./mm. (80 mg. bending strength), was nowhere felt. One with a tension of 66 grm./mm. was felt on the lips, conjunctiva and forehead, but was not felt on the upper

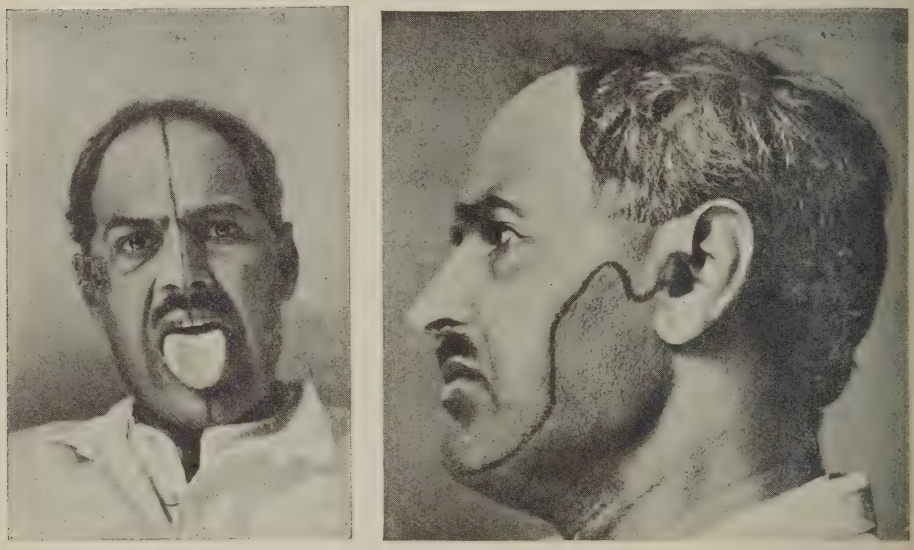


FIGURE 18. Full face and profile of the patient A. L. (Case 3). The area anesthetic to light touch is outlined. The small area of diminished temperature sensation in front of the tragus is shaded. There is diminution of sensibility to pinprick over the upper portion of the face and the corneal reflex is much diminished on this side. The jaw deviates slightly to the left and the masticatory muscles are weak and hypoexcitable. The tongue follows the jaw in deviation, there is no atrophy, and the left side reacts to weaker faradic currents than the right side. The tongue, cheek and fauces are anesthetic to light touch. There is ageusia on the anterior part of the tongue. The facial musculature is weaker on the left side. Pain on deep pressure is reduced on the left side of the face.

eyelid, nose or chin. It was only when the next stronger hair was used, one with a tension of 83 grm./mm. that touches were felt everywhere. These last two hairs had bending strengths of 120 and 375 mg. respectively. On application they produced evident deformation of the cutaneous surface so that it seems that pressure nerve endings must have been responsible for the sensation rather than simple tactile endings.

(*To be continued*)

Society Proceedings

THE WASHINGTON SOCIETY FOR NERVOUS AND MENTAL DISEASES

December 17, 1926, Lawrence Kolb, the President, Presiding.

SPECIFIC DIAGNOSIS AND TREATMENT OF EPIDEMIC ENCEPHALITIS

By Walter Freeman, M.D.

director of laboratories, st. elizabeths hospital, washington, d. c.

(Abstract)

Although a diagnostic triad characteristic of lethargic encephalitis was promulgated by von Economo in the early days of the epidemic, it was soon found that many other nervous symptoms and signs were present in the disease, even though the triad might be absent. This led in course of time to the abandonment of the term "lethargic" and to the substitution of the term "epidemic," and in French hands to the designation "neuraxitis." It was gradually realized that the mode of onset and the clinical varieties of the disease were legion. The diagnosis, therefore, became increasingly difficult as more and more forms were recognized by the clinician. The laboratory was called upon for its contribution and yielded important studies in pleocytosis and hyperglycorrhachia, with a nonspecific hump in the colloidal gold curve. This phase of the disease (or was it the fashion of the laboratory?) passed off; the findings were recognized to be inconstant and nonspecific. The bacteriologic approach as a diagnostic problem in encephalitis was abandoned following the negative report of the very comprehensive investigation by the Rockefeller group into the specific etiology.

Until a specific etiology has been accepted for any disease, the matter of specific diagnosis based upon these etiological considerations is not to be thought of. Before the acceptance of the Koch bacillus as the cause of tuberculosis, the finding of this bacillus was of no use in the diagnosis of the disease. When its pathogenesis became recognized, the diagnosis of tuberculosis from the laboratory standpoint took a long step forward. The same story might be repeated in the case of many diseases. When investigators can come to some agreement as to the etiology of encephalitis, then specific diagnosis founded upon the isolation of the pathogenic agent may quickly be established.

Miss Evans and I have dealt with the etiology of encephalitis *

* Evans and Freeman: Studies in the Etiology of Epidemic Encephalitis. I. The Streptococcus. Pub. Health Rep., 41:1095 (June 4), 1926; Pub. Health Repts., No. 1085.

and are continuing our investigations along the same lines. We have found microörganisms quite constantly associated with the disease, and have compared our results with those reported in a large number of papers published previously by others. There seems to be no reasonable doubt that we are dealing with the same microörganism as that described in at least ten other papers. We are attempting to explain the finding of a filtrable virus by another large group of investigators. To us a filtrable virus is merely a minute filter passing form of the organism under discussion. If one takes a culture of the streptococcus isolated from the cerebrospinal fluid or midbrain of a patient with encephalitis and filters it through a porcelain candle under careful control with B. prodigiosus, a water clear filtrate is obtained that is rather weak in its effect upon animals. If, however, the filtrate is inoculated into culture medium, larger visible forms appear within twenty-four hours, and the culture becomes extremely pathogenic for animals.

The negative results in the hands of other competent workers are difficult to interpret, for it seems sufficiently easy to obtain positive cultures, although the first ones are often delicate, and after starting to grow, sometimes recede and die off. Small amounts of inoculum have worked best in our hands.

The forms of the organism observed under various conditions of culture are quite numerous, and a full study of the life cycle is in progress. In our first paper we mentioned large coccoid bodies and minute filtrable forms as well as diplostreptococci and rods. The variety of forms here resembles the pleomorphism of the Klebs-Loeffler bacillus. Consequently any organism isolated from a case of encephalitis is regarded with suspicion and tested for virulence by animal inoculation. All this work has been done by Miss Evans at the Hygienic Laboratory, U.S.P.H.S.

We have isolated organisms virulent for rabbits and monkeys from the blood stream in four cases of acute encephalitis, and one recurrent acute. From the spinal fluid we have obtained it in three acute cases and four chronic cases out of seven. In our necropsy material we have encountered it in the brain in one acute case, one recurrence, and three chronic cases out of four. Incidentally we have isolated it from the spinal fluid or brain of five out of seven cases of "idiopathic" paralysis agitans in whom there was no history of encephalitis.

We believe, on the basis of our work so far, and upon its agreement with the work of a number of others that the organism studied by us is the specific causative agent, and that the diagnosis of encephalitis can be made by culture of the blood and spinal fluid.

When a case of suspected encephalitis comes under observation, a few drops of blood and of spinal fluid are inoculated into six to twelve tubes of meat infusion broth with the meat left in and titrated to pH 7.4, or of the ordinary dextrose brain broth. Anaerobic cultures are not necessary. Should a growth develop it is tested for virulence by intracerebral injection into rabbits. If the culture is active, the animal usually dies in eighteen to twenty-four hours. A mixture of

organisms is readily handled by filtration, the culture of the filtrate yielding only those organisms associated with encephalitis. The specificity and elective localization of the organisms may be tested later, but it is sufficient for diagnosis to know that the inoculated animal dies within 24 hours after a small intracerebral dose.

We have found organisms in the spinal fluid and in the brain at necropsy from cases other than encephalitis, but in these cases the virulence is so low that animals do not die after receiving an intracerebral injection. Similar nonvirulent organisms have been found by Miss Evans in the brains of supposedly healthy animals. This raises the interesting question of specific exciting cause from some of the psychoses. Our control material for nonpsychotic individuals has not been available up to the present, so that we can merely state a hypothesis based upon the finding of a high percentage of positive cultures from the brains of the insane. I am indebted to Winifred Ashby, Ph.D., for this summary of the problem upon which she is working in this laboratory. Her findings were recently reported at one of our informal staff meetings.

We believe that an attack of encephalitis may underlie the development of a number of forms of chronic psychoses that remit and relapse with slow mental deterioration of the patient. If we examine catatonic individuals by means of specific tests to bring out parkinsonian defects I believe we shall find a fairly large number of cases of paralysis agitans among our chronic psychotics. I have picked up half a dozen more or less typical cases in the course of an hour's hasty survey, and there are probably many more. Many of these patients were admitted to the hospital, apparently in the same condition as at present, years before the epidemic of encephalitis made its appearance.

In view of this and of the frequency of psychotic onset in encephalitis, we suspect encephalitis in any acute mental disturbance with fever.

During the past seven months we have had occasion to treat three patients in the acute state of encephalitis with a specific antiserum developed by the Mulford Company. Their culture was originally obtained from one of our fatal cases. The use of the serum in each case has been followed by gratifying improvement in the clinical symptoms, and in one case it apparently was life saving. It is too early to say whether the serum had a specific or a nonspecific action. In one case the blood culture was persistently positive in spite of several doses of serum, and two blood transfusions. It became negative under vaccine therapy.

After the recovery from the acute manifestations, autogenous vaccine has been administered with the idea of raising the individual's resistance against persistent or recurrent infection. As I have previously shown,* the late complications and sequels of encephalitis are evidence of continued infection, and I think we may best combat this infection by the use of a specific, preferably autogenous vaccine. This has been injected in ascending doses.

* Freeman, Walter. Chronic Epidemic Encephalitis. J. A. M. A., 87:1601 (Nov. 13), 1926.

We have used this vaccine in several cases of chronic encephalitis, but so far with very slight if any improvement. There has been no progression of the symptoms in these individuals and it therefore seems possible that the disease may be arrested by vaccine therapy. It is too early to announce an opinion. Probably a good plan would be to keep patients under rather close observation for a long period of time just as is done in syphilis, being guided in the treatment by culture of the blood or spinal fluid, and administering courses of vaccine as indicated by a return to positive of the culture.

In summary it may be said that we accept the specific etiology of epidemic encephalitis and are making use of the bacteriological findings in the diagnosis and treatment of the disease. We suspect that the same organism will be found responsible for a larger proportion of cases of mental disease than heretofore recognized. We suspect any patient presenting acute mental disturbance with fever of having encephalitis and we attempt to substantiate it by culture of the blood and spinal fluid. If the bacteriological diagnosis is positive we inject intravenously a serum prepared by vaccinating animals with this organism and so far have had three satisfactory results. After the acute stage is over we have treated patients by autogenous vaccine and seen the virulence of the isolated organisms reduced, or the organisms banished from the circulating fluids. We believe that by means of vaccine we may prevent the development of the disastrous after-effects of encephalitis or stop them in the course of their development. We expect no considerable improvement in the motor manifestations of those in whom the parkinsonian syndrome has developed.

Abstract of Discussion

Dr. Moore: I have not had much experience with the bacteriological studies in psychiatry, but think that in encephalitis they may lead to further advances. I have in mind a case upon which various diagnoses have been made, and which Dr. Freeman is now studying. The symptoms are certainly like those of hysteria, yet there is not the proper background. Some neurologic signs have recently developed that make me quite suspicious of encephalitis, and should Dr. Freeman obtain positive cultures in the case I would be satisfied that it was a case of encephalitis.

Dr. Wm. H. Hough: Dr. Freeman's control material is noticeable by its absence, and I do not think we can accept his work until more thorough controls have been undertaken. As to the serum we have a good example that Dr. McCoy called attention to not so long ago. The individual reports are unfailingly good, yet the reports from the public health officials condemn Dr. Rosenow's serum as of no use. I personally doubt very much whether the good results in the cases reported by Dr. Freeman were specifically due to the serum.

Dr. Harry Stack Sullivan (Baltimore): It is not only infections that give rise to attacks of mental disease, but many other things, and I question whether an organism is responsible for any acute psychosis with fever. Psychoses develop in pregnancy and in the puerperium, for instance. There are, however, many patients whose symptoms

are far from clear cut, whom we cannot label with any of the well known diagnostic terms, and whose psychoses tend to recover. I do not doubt that some cases of illness in this mongrel type may be due to infection, possibly encephalitis. Before the problem can be solved a large amount of work must be done upon the chemistry of the body, particularly the H-ion concentration, to determine the reason why the brain is infected by the pathogenic agent. Dr. Freeman states that this organism is found in the nasopharynx of healthy individuals. The route of infection is presumably by way of the communicating lymphatics, but why should the organisms penetrate to the brain? What Dr. Freeman says about the number of parkinsonians among our psychotic population should be carefully checked up. If his findings are accurate it is a matter of great importance, and these cases should not be overlooked. Finally, I would like to ask whether these cultures can be made by any well-qualified technician, or whether it requires professional skill.

Dr. Clarence H. Rice: I would like to ask whether any tests of potency have been made for the serum, and whether any skin tests have yet been developed.

Dr. Freeman (closing): The case that Dr. Moore mentioned has yielded a positive culture from the spinal fluid, and we are about to undertake serum treatment followed by autogenous vaccine. In this instance a staphylococcus of very variable size has grown out. I think that the serum referred to by Dr. Hough was that developed against poliomyelitis. The encephalitis serum of Rosenow has not yet attained the dignity of a public health problem. I admit that the controls are far from complete, but the available cases for serum therapy have been very few. Dr. Sullivan's remark about the psychoses brought on by other accidents, particularly pregnancy, brings to mind the fact that chorea in pregnancy is sufficiently frequent to be placed in a separate category. We are coming to believe that chorea is a manifestation of some type of encephalitis. The cultures could probably be made by an experienced technician, but the animal experiments necessary would probably require more training than is possessed by the usual technician. The work is too new yet to be certain about the potency of a serum as determined upon experimental animals, and no skin test has been developed. I think it would be rather dangerous to inject intracutaneously any filtrate of the organism associated with encephalitis on account of the filtrable forms. The occurrence of encephalitis following vaccination has been reported so often as to cause some concern. The rabbits inoculated with material from healthy throats either did not react at all, or developed a much milder affection with tendency to recovery. The outbreak of the acute disease in 1917 is probably to be explained on the war conditions of malnutrition and lowered resistance just as in the case of influenza. Once the disease got started, repeated passage through human hosts probably augmented the virulence of the organism. Ordinarily the virulence is low.

Current Literature

I. VEGETATIVE NEUROLOGY.

1. VEGETATIVE NERVOUS SYSTEM.

Alvarez, W. C. Blood Pressure Study. [Arch. of Int. Med., July, Vol. XXXVIII. J. A. M. A.]

An analysis was made by Alvarez of the systolic blood pressures of 6,000 men and 8,934 women freshmen entering the University of California. The pressures of the women were more uniform than those of the men, and averaged 11 mm. lower. Hypertension was very common among the younger men, about 45 per cent having pressures exceeding 130, and 22 per cent having pressures exceeding 140 mm. Among the women, about 12 per cent had pressures exceeding 130, and about 2 per cent had pressures exceeding 140 mm. The average pressure for both men and women drops gradually during the first years of adult life. The pressures for the men are grouped mainly about 127 mm. at the age of sixteen, and about 118 mm. at the age of thirty. The pressures for the women are grouped about 118 mm. at the age of sixteen; about 111 mm. at twenty-four, and about 117 at forty. Alvarez says that hypertension cannot be ascribed regularly to infections or to a strenuous life. It seems to be an inherited peculiarity, the appearance of which can be suppressed in women so long as the ovaries function well.

Hand, A., and Reilly, J. J. Raynaud's Disease in Children. [Am. Med. Jl., Aug., 1923. J. A. M. A.]

Three cases occurring in one family are reported by Hand and Reilly, the patients being aged five, two and one-half and eight and one-half years, respectively. Hereditary syphilis was suggested in these cases as both parents had positive Wassermann reactions; with the exception of snuffles in one case during infancy, none of the three children presented signs of syphilis and the diagnosis was therefore made by the Wassermann test.

Tigges, O. Treatment of Migraine. [Deut. med. Woch., May 25, Vol. XLIX.]

The author apparently has had excellent results in this report of three patients treated by nasal application of a mixture of 0.5 parts cocain hydrochlorid; epinephrin 1 part (1:1,000) and distilled water to 10 parts. The application was repeated two or three times for three months. After the first few applications the attacks ceased. Neither the

nature (etiology) of headache nor the rationale of results are sufficiently discussed. [Psychogenic migraines (the majority) are often relieved through transference, the drug or other procedure being but a rationalization.—Ed.]

Pavey-Smith, A. B. Causes of Headache. [Lancet, Sept. 8, 1923.]

This paper deals with a mixed type of classification of headaches. He makes three main groups, as follows: (1) Intracranial, due to appreciable somatic changes occurring within the cranial cavity. (2) Cranial, due to processes affecting the cranial walls and their air spaces. (3) Extracranial, due to somatic alterations outside the cranium. By "process" is meant the actual organic condition directly responsible for the head pain. Thus, in an intracranial headache (Group 1) the pain arises as a result of some intracranial change. This intracranial change may itself be due to some extracranial and more general condition, but the headache is only "extracranial" if the actual pain causing lesion is outside the skull. These groups, in fact, refer to the starting point of pain, and not to the condition with which that pain is associated. In supraorbital neuralgia (Group 3, extracranial) the patient complains of a pain which shoots upward into the forehead, and the maximum tenderness will be found over the nerve. Pressure near the supraorbital notch will increase the severity and area of the pain. In frontal sinus headache (Group 2, cranial) the pain is fixed, dull, and may be throbbing; the maximum tenderness is usually on the floor of the sinus under the inner third of the supraorbital margin. Superficial tenderness is not so marked, and pressure over the supraorbital notch has no definite effect. In supraorbital headache of intracranial origin (Group 1) there is no tenderness, though there may be hyperesthesia to finer skin tests.

Moses and Warschauer. Pathogenesis of Pernicious Anemia. [Klin. Woch., Vol. II, March 26. J. A. M. A.]

Moses and Warschauer injected extracts of feces prepared according to Seyderhelm, who claimed that they have a hemolytic action in vivo, though not in vitro. They found that these extracts cause only nonspecific variable changes in erythrocytes and leukocytes, the same as other injurious substances. Seyderhelm claims to have found a pernicious type of anemia only in rabbits injected with extracts of mesenteric glands from persons who had died from pernicious anemia, but not from controls. They found similar changes in a rabbit injected with an extract of rabbit's muscles.

Duane, A. Ophthalmoplegic Migraine and Recurrent Paralyses of the Eye Muscles. [Arch. of Oph., Sept., 1923. B. M. J.]

A. Duane records three cases of migraine associated with ophthalmoplegia, and reviews the literature of this condition. He defines opthalmoplegic migraine as a "syndrome characterized by irregularly recurring

migraine-like attacks which terminate in a complete or incomplete paralysis of one or more of the motor nerves of one eye, especially the third nerve. The paralysis, at first intermittent, tends to become later remittent and eventually permanent. Coincident affections of other nerves, especially the fifth nerve, occasionally occur." The condition is usually unilateral. There are three types of recurring paralyses. (1) Recurrent nuclear paralyses. These are most frequently associated with tabes, but may occur in diabetes and in chronic progressive ophthalmoplegia. (2) Basal recurrent paralyses. The type form of these paralyses is ophthalmoplegic migraine. In most cases the cause is very uncertain, intermittent compression of the nerves at the base from tumor or inflammatory deposits being the most probable etiological factors. (3) Cyclic paralysis. An extremely rare condition in which there is an alternation of paralysis with spasm. This rare condition is most common in females, and is either congenital or acquired in very early life. The site of the lesion is unknown. The typical attack of ophthalmoplegic migraine starts with severe one-side headaches associated with nausea and vomiting, which after lasting a few days disappear and are replaced by a unilateral oculomotor paralysis usually on the same side as the head pain. After a variable time the paralysis subsides, only to recur at some time later in conjunction with another attack of head pain. Duane considers that the condition cannot be due to a nuclear lesion, but rather to injury to the radicles or trunk of the oculomotor nerve. This view is supported by the results of post mortem examination. Such cases as have been examined showed either benign tumor, an inflammatory exudate, or a tuberculous mass involving the nerve. Treatment is most unsatisfactory. Removal of all possible causes of infection and improvement of the general condition, together with correction of any refractive error, is all that can be done.

Hahn, L., and Stein, F. Pathogenesis and Therapy in Migraine. [Ztsch. f. Nervhlk., Vol. LXXVII, Nos. 1–6.]

The latent migraine patient, the authors believe, is of a definite type like the asthenic patient. The migraine attack itself is a cerebral vascular crisis. This is attested by the fact that intravenous administration of papaverin checked the attack in 90 per cent of the cases.

Roberts, F. Action of Vasoconstrictor Substances on Arteries of Brain. [Jl. of Phys., Aug., 1923.]

In this study upon animals pituitary extract, ergotoxin and barium chlorid were tested out as to their vasoconstrictor action upon the cerebral vessels. Diminution or complete stoppage of respiration could be caused by each of them. Roberts argues that inasmuch as this effect occurs when the blood pressure is prevented from rising, it may be referred to anemia of the respiratory synaptic regions by cerebral vasoconstriction.

Pituitary extract causes two periods of apnea in rabbits. Of these the second is proved to be related to cerebral vasoconstriction. Reasons are given for believing that the first is due to a similar cause. The second apnea is sometimes followed by Cheyne-Stokes respiration, the periods of which are related to changes in blood pressure. The fact that these substances all resemble epinephrin in their effect on respiration and especially the close similarity which exists between pituitary extract and epinephrin is confirmatory evidence for the view already expressed that epinephrin is vasoconstrictor to the brain vessels.

Bigland, A. D. Treatment of Migraine by Calcium Lactate. [Brit. Med. Jl., Dec. 15, 1923.]

A clinical study tending to demonstrate the value of thirty grain doses of calcium lactate taken at the very first signs of a migrainous headache. The results obtained are in the nature of mitigation rather than abortion of an attack. [Since in the abstract statistical study of migrainous attacks 60 per cent at least rarely fulminate the reasoning of the paper is faulty.]

Ramain, P. Action of Light on the Blood. [Arch. Mal. du Coeur, Oct., 1923.]

Immediately after exposing subjects for a few minutes to sunlight or ultraviolet and infra-red rays phenomenon resembling the hemoclastic crisis of Widal occur. The explanation suggested is of a vasomotor reaction due to dissolution of leucocytes.

Redfield, A. C., and Bright, E. M. Hemolytic Action of Radium Emanation. [Am. Jl. of Phys., July 1, 1923.]

This study tends to show that the destruction of erythrocytes by radium emanation is due chiefly to the alpha rays. The processes of hemochromolysis and stromatolysis proceed independently of one another. The electrical resistance of the suspension increases as hemochromolysis proceeds, and is reduced again when stromatolysis occurs.

Crawford, J. H. Influence of Vagus on Heart Rate. [Jl. of Pharm. and Ex. Ther., Aug., 1923. J. A. M. A.]

The age incidence of maximum vagal activity in normal persons, according to Crawford, is from ten to forty, being at its height from twenty to thirty. After this it steadily begins to decline, there being a marked fall after fifty. There is considerable individual variation, especially in young persons. There is no difference between the two sexes in their reaction to atropin as studied by the increase in heart rate. The increase in heart rate after atropin administration cannot be foretold from the heart rate before injection. There is a diminished reaction to atropin in all cases of chronic heart disease, in which the sinoauricular node is in control, especially in aortic disease. Auricular fibrillation shows an increased reaction to atropin but is not comparable to the other heart

conditions as the normal pacemaker is not in control. Typhoid fever and pneumonia during convalescence show a diminished reaction and exophthalmic goiter shows the same to a less extent. In convalescence from rheumatic fever and chorea the reaction to atropin is increased. It is suggested that the varied results obtained are due to three factors: (a) alteration of the tonicity of the cardioinhibitory center; (b) changes in the vagal terminations in the heart itself, and (c) changes in the cardiac muscle.

Strasburger, J. The Treatment of Migraine with Luminal. [Klin. Woch., Aug. 20, Vol. II.]

A clinical record of nine cases of migrainous headaches treated by luminal in the last two years. Continued treatment of migraine with luminal in a daily dose of 0.1 gram or a little less diminishes markedly the number and severity of the attacks which relapse after dropping the drug. The drug was given in the evening in one dose of 0.1 gram, or half this quantity was given twice a day. Intestinal sluggishness requires aperents. [Another source for drug forming habit.]

Henry, A. K. Resecting the Left Cervicodorsal Ganglion of Sympathetic in Angina Pectoris. [Irish Jl. of Med. Sc., April, 1924. J. A. M. A.]

Henry approaches the cervical ganglion by the posterior route, that is to say, by a costotransversectomy at the level of the first rib. The seventh cervical spine is the point of a sort of half circle incision which gives a good exposure of the underlying muscles, trapezius, rhomboids and serratus posticus superior, whose origins are divided and the second rib is found and divided from the costotransverse articulation. The sympathetic cord can now be seen close to the vertebral body, lying on the pleura like a tape. The sympathetic cord is divided between the cervicodorsal and the second dorsal ganglion, also the communications between the back of the ganglion and the eighth cervical and first dorsal nerves. The right index finger is passed, nail down, into the interval between the ventral face of the ganglion and the back of the vertebral artery, and by gentle traction on the sympathetic cord the ganglion is lifted so that the branches which pass to the artery come into view. These are divided. Next, the cord which passes up to the middle cervical ganglion is cut. The resection of the ganglion is completed by dividing the inferior cardiac nerve.

Adler, F. H., et al. Tonic Effect of Sympathetic on Ocular Blood Vessels. [Arch. Ophthal., May, 1924. J. A. M. A.]

Adler et al. show that when the blood pressure is raised the intraocular pressure is increased. This increase, however, is kept in check by a local vasoconstriction of the ocular blood vessels through the cervical sympathetic. This mechanism is a protective one to the eye, and prevents sudden changes in general blood pressure from causing harmful changes

in intraocular pressure. This protective action is increasingly effective as the blood pressure ascends. No effect on intraocular pressure is seen when the cervical sympathetic is cut at normal blood pressure. In the normal animal, as the blood pressure is raised, the intraocular pressure rises in direct proportion to it.

Rockwood, R., and Barrier, C. W. Calcium Treatment for Edema. [Arch. Internal Med., May, 1924. J. A. M. A.]

Rockwood and Barrier have tried the effect of large doses of calcium salts (from 12 to 18 gm. daily) in cases of massive edema of diabetic and nephritic origin. In six of seven cases, most of which had been resistant to other methods of treatment, edema disappeared completely. In one case, edema disappeared, but the part played by the calcium is questionable. In two cases of nephritis, edema recurred later. None of these cases were complicated by significant myocardial damage, and in none was any other diuretic given with the calcium. In the few instances in which small doses of calcium (from 1 to 3 gm. daily) were used, little or no effect was observed. In some of the cases, edema was reduced by calcium lactate. In other cases, calcium clorid seemed more effective. Large doses of calcium do not seem to increase the amount of serum calcium. In one case of chronic glomerular nephritis, renal function was definitely improved as the edema subsided. In one case of diabetic edema, the basal metabolic rate rose during the administration of calcium from — 13, April 21, to an average of + 57, May 9. A similar dose of calcium did not produce a change in the basal metabolic rate of a normal person. In the other cases of edema discussed, the administration of calcium had no effect on the basal metabolic rate. The authors suggest that the high calcium content of milk may explain its diuretic action, and thus its popularity in the treatment of acute nephritis.

Stout, A. P. Ganglioneuroma of the Cervical and Thoracic Sympathetic Ganglions. [J. A. M. A., May 31, 1924.]

The first case reported seems to have been associated with the superior and middle sympathetic ganglions. Six similar cases are on record. The patient was aged two and a half years. At five weeks of age, a mass thought to be a gland appeared on the right side of the neck. This had increased with throat infections, and decreased in the free intervals. When first seen, the mass extended from the right lower border of the lower jaw to the lower third of the neck. It reached the midline anteriorly and to the posterior border of the sternomastoid laterally. The left side of the neck was normal. Examination otherwise was negative. The clinical diagnosis was tuberculosis of the cervical lymph glands. At operation a mass was seen filling up the submaxillary triangle and the middle half of the neck from the thyroid cartilage to behind the sternomastoid. Posteriorly, it extended to the vertebral column. It was removed without much bleeding, being firmly adherent to the thyroid

cartilage and the fascia in the region of the tonsil. On microscopic examination, it proved to be a ganglioneuroma. In the second case, the tumor came apparently from the thoracic segment of the sympathetic (six other cases from this situation are on record). This patient also was aged two and a half years. Four months before Stout saw him, he began to be unsteady on his feet and soon began to drag his right foot when he walked. Then he grew so weak that he could not sit up. Five weeks before he entered the hospital, he lost control of the bladder and anal sphincters. Otherwise he was a normal baby with normal developmental history. Physical examination disclosed marked dulness over the left upper lobe, front and back. A roentgenogram of the chest showed a dense shadow over the upper portion of the left lung which was thought to be a new growth. There was marked anterior curvature of the thoracic vertebræ. The cervical vertebræ were markedly fixed and rigid. The child could not sit without support, but fell toward the left. Koenig's sign was present in both legs. The reflexes were all present and active. The case was considered inoperable. Seven months later the child was operated on in an attempt to relieve the pressure on the thoracic cord, which had become progressively worse. At that time there was found in the spinal canal, occupying the upper dorsal region and extending up into the cervical region, a very long, encapsulated tumor, extradural and continuous with the mass in the chest by an extension through an intervertebral foramen. The child died shortly after the termination of the operative procedure, and no necropsy was obtained. Microscopic examination of a piece of the tumor disclosed ganglioneuroma.

Pasteur, Vallery-Radot et al. Vagosympathetic Tonus. [Presse Méd., Dec. 15, 1923.]

These authors assert that in urticaria the sympathetic plays a rôle, and that in asthma the vagus conditions the attack. The participation of the vegetative nervous system in the anaphylactic crisis is recognized by all clinicians. Pharmacodynamic tests made in urticaria, asthma and migraine showed such wide divergences, however, to explore the vagosympathetic tonus with such tests is still frought with many uncertainties.

Wolfe, J. T. Ileocecal Delay and Vagus Reflex as Etiologic Factors in Bronchial Asthma. [S. Med. Jl., April, 1923. J. A. M. A.]

Wolfe contends that asthma can be relieved by locating and removing the cause of the hypertonic state of the vagus nerve, and that a majority of the causative pathologic factors will be found within the peritoneal cavity, and that adhesions will constitute a large majority of these intraperitoneal conditions. The production of intestinal toxemia must always be considered as a factor in keeping the patient's health below par. For two years Wolfe has been employing slowly distending enemas daily to

distend the colon, following abdominal operations, to prevent the colon from being bound again by adhesions. Under this method no case has given trouble with adhesions following operation. Also he refrains from feeding the patient till the third or fourth day.

Frey, E. K. The Cardiac Nerves and Asthma. [Münch. med. Woch., Vol. LXXI, May 9.]

This warning note that cutting of one pneumogastric or resection of sympathetic ganglions, as now being advocated by the surgically minded in treatment of bronchial asthma, is dangerous if the heart is not perfect. Digitalis also acts less effectively on a denervated heart. It is probable that the twenty-year-old enthusiasms re glaucoma and sympathetic, hyperthyroid and sympathetic surgery will be recalled.

de Besche, A. Studies on the Reactions of Asthmatics and on the Passive Transference of Hypersusceptibility. [Am. J. M. Sc., CLXVI, 265. Med. Sc.]

The author studied the cutaneous reactions of 86 asthmatics by means of protein extracts of timothy pollen, substances from various animals (horse, dog, cat, chicken, sheep, crabs, lobster, fish), substances like honey, milk, potato, oats, rye, rice, strawberries, nuts, apples, pears, and various bacteria. The most frequent reactions (23 out of 35 cases) were obtained with extracts of horse proteins. It was also shown that several substances may produce a reaction in one and the same patient. Thus one person became asthmatic from pollen, on contact with horses, as well as on eating fish or strawberries. A seven-year-old boy became asthmatic from eating eggs and apples, while his sister developed urticaria, but not asthma, from the same foods. The author made interesting experiments to see whether the serum of an asthmatic hypersensitive to a particular protein can render guinea pigs anaphylactic to the same protein. From 1 to 5 c.c. of the serum of the patient was injected intraperitoneally in guinea pigs, and after twenty-four to forty-eight hours they were injected with horse or cat serum either intravenously or intracutaneously. A series of experiments are given which indicate that guinea pigs can in this way be rendered anaphylactic, and it is shown that by means of the serum of asthmatics a local hypersensitiveness may be produced to horse serum in the skin of previously normal persons. The author holds that certain forms of asthma may be regarded as anaphylactic in nature.

von Gordon, L. The Nature and Pathogenesis of Bronchial Asthma and Its Relation to Hay Fever and to Other Diseases. II. [Schw. med. Woch., LIII, 1132.]

This study holds that bronchial asthma is based upon the equilibrium of the vagus and sympathetic, in consequence of disturbances of the vegetative nervous system. For some reason the threshold for stimuli is lowered and this leads to disturbances. The sympathetic nerve is of great

importance in the development of bronchial asthma, in the form of decreased reactivity. The endocrine glands play a rôle in the development of bronchial asthma. Some cases of the condition may be due to adrenal disturbances, leading to sympathetic hypotonia, which is relieved by the administration of adrenalin. This hypotonia may be associated with increased reactivity of the vagus terminations following a decrease in the blood calcium (disturbances of the epithelial bodies). Adrenalin causes contraction of some muscles (uterus and blood vessels) and relaxation of others (bronchial musculature and coronary arteries of the heart). In cases in which adrenalin fails to relieve the asthmatic attack, it must be assumed that the excitation of the vagus nerve endings is so intense that even the adrenalin stimulation of the sympathetic nerves is insufficient to cause relaxation of the vagus nerves. A combination of atropin and adrenalin may be effective in such cases. The atropin is first administered, to decrease the vagus tension, and then the adrenalin to increase the sympathetic function. The equilibrium of the vagus and sympathetic innervation is thus restored and the asthmatic attack ceases. Decrease in the blood calcium, due to hypofunction of the epithelial bodies is one of the most important causes of the underlying lability of the vagus sympathetic equilibrium.

Bronchial asthma may be defined as an inherited or acquired neurosis, based upon a functional disturbance of the vegetative nervous system, leading to sympathetic hypotonia with or without vagotonia, and to lability of the equilibrium of the vagus sympathetic nerves which react pathologically to normally inadequate stimuli.

2. ENDOCRINOPATHIES.

Marañon, G. Archivos de Endocrinologia. [Jan., 1924.]

This newly founded monthly is issued by Marañón of Madrid, Pi y Suñer of Barcelona, Houssay of Buenos Aires, and Novoa Santos of Santiago, with Carrasco Cadenas of Madrid as editor in chief. The annual subscription is 20 pesetas for Spain and Latin America, but 25 pesetas elsewhere.

Zondek, H., and Reiter, T. Hormones and Cations. [Klin. Woch., Vol. II, July 16.]

Their earlier experiments along physicochemical lines show that tadpoles treated with various hormones react not alone to the hormone, but they require certain electrolytes before their specific action can occur. The vegetative nervous system is the system regulating the electrolytic factors. This maintains the hormone balance. Thus a syndrome may be due to the gland producing the hormone or to defective functioning of the regulating system alone. A hormone normal in amount may have a pathogenic action from change in the electrolytes it encounters in an

organ. In their [Zeit. f. klin. med., 1923] paper they report that the inhibitory action of thyroxin on the growth was counteracted and inverted by calcium. Growth was enhanced by potassium. Both ions changed in a similar way the action of thymus. The vegetative nervous system regulates the action of hormones by changing the constellation of electrolytes on the periphery cell membrane synapse, or secreting cell.

Kraus, F., et al. Electrolytes in the Organism. [Klin. Woch., Vol. III, April 22.]

Kraus, Zondek, Arnoldi and Wollheim present these considerations relative to the significance of electrolytes in the body. An important rôle in humoral processes in lower animals before the vegetative nervous system develops is to be seen in ionic activities. Thus potassium produces effects identical with those from vagus stimulation, while calcium has an action similar to that of the sympathetic. They increase or reduce the existing functional capacity of the cells, lactic acid production in muscles being an illustration. The constellation of electrolytes is brought about by the nerve stimulus. Changes of hydration then follow. Glycogen now comes into contact with the ferment, which splits it into lactic acid. The permeability of the surface systems is influenced by the electrolytes, as well as the electric charge of proteins. Fatigue of muscles can be increased or decreased. The fundamental reactions of the cell to stimuli are thus determined, and here is another aspect of what is called constitution. Without calcium digitalis cannot act and the muscle action of guanidin is inhibited by it. Body fluid tests are not satisfactory since local variations can exist. Thus loss of blood calcium is not the cause of tetany, any more than azotemia is of a kidney lesion.

Orator, V. New Points of View in Estimating Pharmacodynamic Functional Tests. [Mittl. a. d. Grzgb. d. Med. u. Chir., Vol. XXXVI, Nos. 2–4.]

Orator gives results of experiments with adrenalin and pilocarpin. Individuals with highly active thyroid (Basedow, diffuse parenchymatous goiter, diffuse colloid goiter) showed rapid resorption and also strong general reaction. Those with thyroids of lowered activity (rather old nodular goiter) revealed distinct local reaction and weak general reaction. After operation the situation was reversed, the general reaction was strengthened in adenomata, weakened in diffuse goiters.

Ehrström, R. Derangement in Hormone Function. [Klin. Woch., Vol. III, April 29.]

The suggestion is here advanced that certain poisons are capable of so binding hormones as to paralyze their activity. The destruction and new formation of hemoglobin, according to Ehrström in support of which he states that extremely small quantities of Seyderhelm's oestrin (0.08 mg.) can kill a horse. A grave anemia, which may be due to paralysis

of a hormone which regulates the erythropoiesis results if smaller doses of oestrin are given.

Gow, A. E. Endocrinology from Physician's Point of View. [Brit. Med. Jl., April 19, 1924.]

The majority of extracts of ductless glands administered by mouth, as at present prepared, have no definite effects. Tissue extracts in general, when injected intravenously, give similar effects as any foreign protein, and are in no way specific with few exceptions. Thyroid or parathyroid are alone absorbed as such from the alimentary tract. Epinephrin nevertheless is valuable in shock, in asthma and other spasmodic affections such as cardiospasm, urticaria and angioneurotic edema, and pituitary extract is a stimulant to a failing myocardium, especially in toxic myocarditis and in the third stage of labor. If any advances in therapeutics are to be made with glandular extracts the blunderbuss method still so abundant in ordinary drug therapy in the hope that one among the many may hit the mark must be abandoned.

Bauer, J. Individual Constitution and Endocrine Glands. [Endocrinology, Vol. VIII, May. J. A. M. A.]

Bauer stresses the importance and high power of the chromosomes and their constituents, to show that the endocrine glands generally are only, as it were, condensers or multipliers of certain chromosomal potencies, and that not everything which may be attributed to pure endocrine disturbances is, in reality, of endocrine origin. The interference of general chromosomal (*i.e.,* constitutional) and of incretory influences is to be taken into consideration in the greatest number of cases in which unsatisfying hypothetic suppositions of pure hormonal trouble usually are to be met with. In a purely experimental way, Bauer is treating cases of dwarfism and infantilism with extracts of fetal organs, partly from fetal calves and partly from human fetuses. These experiments seem to be yielding satisfactory results.

Zondek. Relativity of Action of Hormones. [Deut. med. Woch., Vol. L, March 21.]

This interesting paper deals with a number of important physicochemical conceptions. Among other things he and his colleagues have shown that the action of thyroxin on tadpoles may be increased or even reversed by different ions. An expected increase in metabolism of dogs after 1.3 mg. of thyroxin by adding 0.3 gm. of calcium chlorid can be checked. The action of pituitary extract can be enhanced by potassium chloride and inhibited by chloride of calcium. The action of insulin does not depend on the amount of the ions but on the difference between the antagonists. Hormone action is thus reversible according to the condition of the cells on which they act. Thus the paradoxical coexistence of exophthalmic goiter with hypothyroid syndromes might be explained

by a relatively high concentration of calcium ions in the organs which show the hypothyroid syndromy.

Kamiga, Rikei. On Beriberi Disease of Mammalians and Birds Which Develops in the Condition of Potassium Deficiency and Therapeutic Value of Potassium Preparations Against Beriberi. [Jl. Exper. Med., Vol. XXXVIII, Aug.]

In his previous communication, the author dealt with beriberi-like disease caused by overfeeding of sodium salts, which would result in potassium deficiency. The experimental animal was fed with usual ration, with which no symptoms of beriberi-like disease developed. In the present communication he deals with the experimental feeding of the animals with polished rice alone and polished rice mixed with salts combined with a large amount of sodium bicarbonate or sodium carbonate. In the animal routine course of polished rice disease developed, but by mixing a small amount of potassium bicarbonate into the polished rice feeding, the development of the symptoms was markedly postponed. In the excess feeding with sodium bicarbonate and polished rice, there developed besides the genuine symptoms and pathological changes of polished rice disease, other intercurrent symptoms, as well as the latent paralysis developed earlier than in the control animals. In the sodium animals or potassium deficit animals, the symptoms were ameliorated by vitamin B. Organic paralysis ameliorates very soon by a liberal administration of vitamin B and potassium. In sodium excess feeding, however, the amelioration takes place very slowly and often resulted in chronic course of the disease.

Bickel, G., et al. Cardiac Infantilism and the Endocrines. [Rev. Fran. d. Endocrin., Vol. I, Feb.]

The retarded development of the body in congenital affections of the heart is here discussed. Changes in the pituitary, thyroid and suprarenal glands were found and are causally related by them to the cardiac infantilism. These as well as most authors are unaware of Lewis' important study on constitutional factors in dementia precox where may be seen the beginnings of these aplasias much more logically elaborated than by pointing a finger at this or that gland.

Engelbach, W. Diagnostic Endocrine Clinic. [Endocrinology, Vol. VIII, May.]

The author here divides endocrine anomalies clinically in seven groups: (1) Bilobar insufficiency of the hypophysis, presenting four cases of juvenile adiposity and emphasizing the diagnostic significance of the distribution of fat and the necessity of early treatment to prevent disastrous disturbances in later life in the sexual system; (2) thyropituitary (posterior lobe) insufficiency, diagnosed by overweight at birth, by retardation of dental development, of walking, and of speech; (3) thy-

ropituitary (anterior lobe) insufficiency, lacking the adiposity of group II and showing physical underdevelopment; (4) thyroid insufficiency; (5) pluriglandular insufficiency with epilepsy, where the case presented demonstrated the relationship of the internal secretions to the eyes and to the teeth, as well as to the mental makeup or nervous system; (6) anterior lobe pituitary hypersecretion, which may stimulate overgrowth of the osseous system; (7) Raynaud's disease in a woman with secondary hypothyroidism as shown by a high basal metabolic rate, in spite of which she has been gaining in weight.

Korenchevsky, V. Glands of Internal Secretion in Beriberi. [Jl. of Path. and Bact., Vol. XXVI, July.]

(a) Hypertrophy of the suprarenals; (b) atrophy of the thymus; (c) atrophy of the spleen with persistence of the islets of the germ centers, often accompanied by an increase in their number and size and frequent hypertrophy and hyperplasia of the islet cells. These were the chief changes observed in pigeon beriberi.

Sansum, N. D., and Blatherwick, N. R. Sources of Error in Organotherapy as Illustrated by Reparation and Administration of Insulin. [Endocrinology, Vol. VII, Sept.-Nov. J. A. M. A.]

Sansum and Blatherwick believe that organotherapy, in general, has a wonderful future, but its future development will depend not on empirical, haphazard methods of study but on the type of study which has led to present knowledge of such products as epinephrin, thyroxin, pituitary extract and insulin.

Kocher, A. Constitution and Surgery with Especial Reference to the Endocrine Glands. [Schweiz. med. Woch., LIII, 223.]

Hereditary and acquired constitution must first be distinguished. He defines a normal constitution as one in which all the organs perform their function in a manner adequate to the demands of the body, and in which there is harmonious correlation between these organic functions. The judgment of abnormal constitution is frequently only relative. This article reviews many of the well known syndromes viewed from a narrow endocrinological viewpoint so frequently seen in those surgeons unaware of the intricacies of the "body as a whole."

Goldstein, Hyman. Rôle of the Endocrines in the Growth and Nutrition of Children. [N. Y. Med. Jl., Vol. CXX, Jan. 2.]

The ductless gland secretions play a great rôle in preparing the tissue cells to utilize the food elements. Malnutrition in childhood is more than a question of insufficient food or deficient vitamines. It is not rare to find an excellent state of nutrition where the food supply is scanty and vice versa. The malnutrition which is severe enough to be reckoned as a factor in faulty development is usually the result of a hypoplasia

or endocrine insufficiency. There seems to be a close connection and dependence existing between the functions of the vitamines and the ductless glands in which the hormones prepare the tissues giving them receptive power to receive and properly utilize the vitamines. In the case of rickets and to a lesser degree in marasmus, small doses of thyroid start them on the road to improvement where other methods fail. We have also certain types of children with a background of dyscrinism giving rise to malnutrition. The hypo- and hyperadrenal; hypo- and hyperthyroid and lymphatic or thymic types and malnutrition associated with blood dyscrasias. In glycosuria and its complications the metabolic disturbance may be traced to an abnormal thyroid, adrenals, pituitary or pancreas. Normal body and mental growth and nutrition are to a certain extent dependent upon a normal set of teeth. The internal secretions have a certain favorable influence upon the dental tissues in bringing about eruption; in arresting decay; in preventing caries and resisting caries. In the causation of caries of the teeth, ductless glandular balance is upset in the direction of calcium hunger. The pituitary, thyroid and to some extent the thymus are the glands usually involved. Aside from the nutritive disorders and trophic lesions (skin) of children, developmental anomalies and disturbances of growth must also be considered. Laboratory investigations and clinical experiences have shown that defects of the thyroid, pituitary, thymus and gonads are mostly responsible for the anomalies of growth and morphogenesis. The difficulty in diagnosis as well as treatment, lies in one's ability to recognize these abnormalities early, when our efforts are more likely to be effective. In the class of growth dystrophies, many of the stigmata obviously are manifestations of an organic nature and should not be expected to be remedied. But since the underlying element is a disturbed function of some of the endocrine glands, their remarkable responsiveness to hormone stimuli may enable us to bring about some noteworthy organic changes. And also the importance of giving early attention to the defective child should be strongly emphasized. In discussing acromegaly and gigantism, the Froehlich, Burnier, Cushing thymogenitopituitary, pluriglandular compensatory thymuspituitary and the amyotrophic syndromes include practically all the possible dyspituitary types. A Wassermann should be taken in these cases because of the close association of syphilis and dyspituitarism. In conclusion, early diagnosis and treatment must be emphasized and each patient individualized. The mode of living of the patient should be regulated as to hours of sleep, recreation, food, regulation of meals, cleanliness, care of the emunctories, etc. From the viewpoint of diagnosis, symptomatology, pathogenesis and therapeutics in nutritional and growth disorders of children, the ductless glands and their internal secretions play an important rôle in solving many of the formerly unknown problems as to the etiology of various complexes and syndromes. [Author's abstract.]

Serdjukoff. Reciprocal Relations Between Endocrine Glands. [Arch. f. Gyn., Vol. CXXI, May 12.]

The general attitude of this study is that the internal secretions are a highly differentiated phase of general metabolism. An extreme instance of the mutual relations between the endocrine organs is described in which the thyroid, the suprarenals, and the uterus all shared in inducing the severe clinical picture. The uterus presented a cavernous metritis, with periodic erectile phases, and the whole clinical picture vanished as if by magic after hysterectomy. More careful research on the internal secretion of the uterus is demanded.

Zondek, H. Pluriglandular Insufficiency. [Deut. med. Woch., Vol. XLIX, March 16. J. A. M. A.]

Zondek publishes several observations on pluriglandular insufficiencies with the necropsy findings. He finds two opposite types: obesity and cachexia, which may be due to opposite disturbances of the same endocrine organs. Cachexia may follow the obesity. He found high metabolic figures in the obesity and low in the cachexia. The endocrine glands play an important part in the accommodation of different animals to seasonal changes, especially hibernation. He finds a similarity in human pathology: Persons with disturbances of the endocrine glands, especially of the thyroid gland and vegetative nervous system, may have sudden changes in weight and deposition of fat without changing their diet, coincident with the seasons. He quotes the history of a young vagotonic girl with distinct degenerative stigmata, who deposited fat regularly with the beginning of the hot season and lost it in winter.

II. SENSORI-MOTOR NEUROLOGY.

3. SPINAL CORD.

Watanabe, T. Cyst Formation in the Spinal Ganglia. [Schweiz. med. Woch., LIII, 407.]

In a series of 150 cases examined on the suspicion of disease of the spinal ganglia, cysts were discovered in forty cases. The cysts were sometimes from 2 to 10 mm. in diameter. They were frequently filled with a clear, aqueous fluid, resembling cerebrospinal fluid. In other cases the cysts were so minute that they were discovered only on microscopical examination. The dorsal and lumbar ganglia appeared to be most frequently affected. The number of cysts varied greatly in individual cases; some patients presented involvement of only one or two ganglia, while in other cases practically all the spinal ganglia contained cysts. The lesions were found mainly in the intervertebral ganglia, or at the border between the ganglia and the posterior roots, or were confined to the posterior roots. The histological appearance was strikingly

uniform. They were covered by one layer of flat epithelium surmounted by a narrow layer of loose, avascular or poorly vascularized connective tissue, containing occasional lime nodules and lymphocytes.

The cases affected twelve men and 28 women; in thirty-six cases the patients were over the age of forty years. Apparently young individuals are rarely affected. There were no clinical manifestations which suggested the presence of cysts. The condition is not responsible for scleroderma or Raynaud's disease.

Guillain, G., and Alajouanine, Th. The Semeiological Value of Dissociation of the Abdominal and Crural Responses of the Medio-Pubian Reflex in Localization of the Height of a Medullary Lesion. [Compt. Rend. Soc. de Biol., LXXXIX, p. 1215.]

The writers' medio-pubian reflex is a periosteal reflex, obtained by striking the symphysis pubis with a hammer, the patient lying on his back, completely relaxed, with lower limbs slightly separated from each other and thighs in slight abduction and external rotation. Normally the reflex gives two responses, an upper abdominal, chiefly of the recti, and a lower, of the pectineus and adductors of the thigh. In a case of flaccid paraplegia due to acute poliomyelitis, medio-pubian percussion no longer gave the normal adductor response, while the abdominal response was absolutely normal. The dissociation of these two responses enabled the writers to localize the upper limit of the lesion below the eleventh and twelfth dorsal segments at level of the first and second lumbar segments. The fact of the dissociation of the medio-pubian reflex may have a double localizing value; for, (1) if it be totally abolished, the lesion is in the lower dorsal medullary lesion, and (2) if it be dissociated, an upper lumbar lesion is indicated. [Leonard J. Kidd, London, England.]

Barré, J. A. Pyramidal Lesions and Vertebral Arthritis. [Médecine, February, 1924.]

Barré records that chronic vertebral arthritis may cause pyramidal symptoms. This may lead to mistaking them for incomplete forms of multiple sclerosis or Pott's disease.

VanderHoof, Douglas. The Etiologic Relation of Achylia Gastrica to Combined Sclerosis of the Spinal Cord. [Archives of Internal Medicine, XXXII, pp. 958–971.]

In a recent clinical study of 451 patients with achylia gastrica, there were twenty-nine individuals with definite evidence of combined sclerosis of the spinal cord. Of these twenty-nine patients, fourteen had pernicious anemia, one had pellagra, in seven the observations were incomplete, leaving seven patients that form the basis of this report. Combined sclerosis of the spinal cord has been regarded as a disease of obscure etiology and hopeless prognosis. The study of these seven cases would seem to show, however, that achlorhydria not only precedes and accom-

panies the development of this nervous disorder, but that it is in all probability an essential predisposing cause. Achylia gastrica thus appears to be as constant a finding in combined spinal sclerosis as in pernicious anemia. In one instance neurotoxins, in the other hemolytic toxins, are evidently produced in the intestinal tract of the individual whose stomach lacks the protective or inhibitory action of the normal hydrochloric acid secretion. The outlook in patients suffering from combined spinal sclerosis, not accompanied by pernicious anemia, appears to be very favorably influenced by persistent treatment with full doses of hydrochloric acid. Of these seven patients, one is subjectively cured, two are apparently well and one is greatly improved. The author is firmly of the opinion that every individual with true achylia gastrica is a potential case of either pernicious anemia or combined spinal sclerosis. He also emphasizes the great importance of adequate hydrochloric acid therapy as an essential prophylactic measure in every case of achylia gastrica. The dose of dilute hydrochloric acid recommended by the author is one dram to one and one-half drams, well diluted, with meals. [Author's abstract.]

Estapé, J. M. Ascending Myelitis in Acute Poliomyelitis. [Arch. Lat. Am. d. Ped., May, 1923.]

Ten days after the onset of acute poliomyelitis a diffuse myelitis of the Landry type developed in this boy, twelve years of age.

Jaroschy, W. Late Injury of Spinal Cord from Scoliosis. [Beit. z. klin. Chir., CXXIX, 245–482, 1923.]

In the two cases here reported upon the severe spastic paraplegia of the legs developed at the ages of fourteen and seventeen years respectively. The paraplegia in one case was completely relieved by laminectomy, and materially improved conditions in the other, in which the paraplegia had been present a long time.

Jarlov, E., and Rud, E. Experimental Multiple Sclerosis. [Hosp., August 1, 1923. J. A. M. A.]

Jarlov and Rud say that a "right interesting" clinical picture developed in the seventeen animals after they had been injected intraperitoneally with blood or serum or spinal fluid from a woman with typical sclerosis in patches. She had been healthy until 1920. The disease in the animals ran a more rapid and a severer course.

Grünewald, E. A. Pathological Anatomy of "Landry's Paralysis." [Jour. f. Psych. u. Neur., Vol. XXIX.]

Grünewald considers Landry's paralysis as a clinical concept which reveals nothing definite as to etiology or pathological anatomical involvement. The clinical course and the anatomical findings are often widely at variance. Grünewald reviews the literature, forty cases with autopsy, and then describes a case of his own where extended investigations of the

nervous system were carried out. There were marked changes in the peripheral nerves (myelin degeneration, proliferation of Schwann's cells, infiltration of lymphocytes); changes in the central nervous system, in the spinal cord, medulla oblongata, brain stem and even in the cortex (nerve cell alterations, proliferation of neuroglia, medullary degeneration, locally, also secondary lymphocyte infiltration and necrosis).

Achard, Ch., and Thiers, J. Cerebrospinal Fluid in Multiple Sclerosis. [Le Méd., 1923, p. 330.]

Multiple sclerosis is very well defined by its lesions: that may be indicative of a specific cause; and as no visceral lesion is found by anatomical examination but in the nervous system, the cause seems to be a neurophil virus.

Indeed many authors have described a specific spirochete. In France, A. Pettit has found it in several occurrences. Professor Achard refers three cases: in two of them the parasite has been made conspicuous by A. Pettit in the cerebrospinal fluid of the patients or in the liquid of inoculated animals (rabbits and guinea pigs).

It is not infrequent to find in the liquid of the patients a positive or subpositive reaction of the colloidal benzoin, according to the Guillain technic, which is always positive in syphilis, another spirochetic infection. But the Wassermann reaction, on the contrary is generally negative in sclerosis. Achard points out this opposite result and he thinks it is a worthy sign for the diagnosis of the multiple sclerosis.

Dowman, C. E. Complete Transverse Lesion of the Spinal Cord with Retention of Superficial Reflexes. [Arch. Neur. and Psych., X, p. 33.]

Dowman reports three cases, with necropsy, in which there was complete severance of the spinal cord at the levels of the fourth and fifth cervical segments, sixth and seventh thoracic segments, and third thoracic segment respectively. In spite of this there was retention of the following superficial reflexes in the parts below the level of the lesion: Cremasteric reflexes on both sides; epigastric, abdominal, cremasteric and plantar reflexes (flexor type) on both sides; abdominal and cremasteric reflexes on both sides. The deep reflexes below the level of the lesion were absent in all cases. The cases were all the result of shell fragment wounds obtained during the World War, and these were not the massive fracture dislocations seen in the usual traumatic cord cases of civil practice. Other observers have noted the retention of superficial reflexes in complete lesion of the spinal cord due to war injury. Guillain and Barré in fifteen cases noted that the plantar cutaneous reflex and cremasteric reflexes were often preserved. Head calls attention to the fact that when the spinal cord has been completely divided, without widespread destruction or septic infection, the lower end may under favorable conditions, regain its tonic influence and reflex excitability. It would seem, therefore, that

as the result of such clinical observations, that part of Bastian's law regarding the superficial reflexes must no longer be accepted. [Author's abstract.]

Achard, C. Cerebrospinal Fluid and Multiple Sclerosis. [Bul. d. l'Ac. d. Méd., May 22, 1923. J. A. M. A.]

Achard obtained a positive reaction to the benzoin test of the cerebrospinal fluid of a woman who had had multiple sclerosis for nine years, and in twenty other cases out of a total of twenty-five, under his own or others' observations. The Wassermann test was constantly negative in all. The benzoin reaction was pronounced in some of the cases in which the clinical picture was far from complete at the time. It may prove instructive to supervise the benzoin reaction during a course of treatment, especially with spirillocidal drugs, to gage the effect. The spirochete found by Pettit and by Guillain in several cases of multiple sclerosis was never discovered outside the nervous system, even at necropsy. In discussing Achard's communication, Guillain stated that he had obtained a positive reaction to the benzoin test in the spinal fluid in six out of ten cases of multiple sclerosis, but the colloidal gold and mastic reactions were positive also. It indicates a progressive lesion, and becomes negative as the progressive wave subsides.

Müller, C. Priapism. [Bruns' Beitr. z. kl. Chir., Vol. CXXVIII, No. 3.]

Müller discusses the etiology and pathogenesis of priapism and reports several cases. Priapism occurred in a patient forty-seven years old, suffering from spondylarthritis ankylopoetica with whom incision in the erectile tissue produced extensive improvement but with chronic loss of the capacity for erection. Priapism occurred in another patient after a myeloma in the first thoracic vertebra with pressure upon the spinal cord. The history is given of a case of so-called idiopathic priapism and mention is made of a phenomenon exceedingly rare observed by the author, a priapism continuing after death.

Rehbein, M. Ossification of Muscle After Spinal Cord Injury. [D. Zschr. f. Chir., Vol. CLXXVIII, Nos. 1, 2.]

Rehbein presents a case analogous to one described previously by Israel. The patient was a soldier, twenty-three years of age, shot through the spinal cord in the cauda equina at the second lumbar vertebra. There was almost complete paralysis of the pelvic and leg musculature. Four months later the X-ray confirmed the clinical picture of ossification of the muscles of the thigh and pelvis, also in the lower third of the femur and within the knee joint. The patient took his own life after four years. Autopsy showed that the iliopsoas musculature and that of the upper third of the sartorius were intact with degeneration elsewhere. Ossification of the inferior iliopsoas, of the pectineus, of the medial,

deep gluteus minimus division and of small portions of the adductors existed in close association with the femur. In the region of the knee joint the pes anserinus, vastus med. and lat. and the articularis genu were ossified. The bony neoplasia corresponded in structure to the longitudinal direction of the muscle. Beside the trophic neurosis which would prepare the way for the ossification a mechanical cause for its origin is probable, the stimulus of the muscular pull. The upper third of the generally ossified muscles was intact and capable of function. The force of this portion would be carried over the paralyzed portions to the insertion at the bone and so give the stimulus to the bony formation.

Schuster, J. Sclerosis Multiplex and Diffuse Sclerosis. [D. Ztschr. f. Nervhlk., Vol. LXXVII, Nos. 1–6.]

Spirochete-like forms were found in three cases of the multiple sclerosis syndrome in permanent preparations.

Viets, H. R. Acute Ascending Meningo-Myelitis, Possibly Resulting from Arsphenamin Therapy. [Bost. Med. and Surg. Jl., CLXXVIII, 895.]

The patient was an outdoor telephone worker, thirty-eight years old, whose illness began suddenly with malaise, sore throat and muscular weakness followed in a few days by complete paralysis of both legs with loss of sensation up to the ribs. The condition was rapidly progressive. When examined on the fourth day of his illness, breathing was almost entirely diaphragmatic because of paralysis of the intercostals. Anesthesia was absolute up to the fourth cervical segment. There was incontinence of both urine and feces. There was complete paralysis of the legs and no movement of the arms was possible. Tendon jerks were uniformly absent. The spinal fluid had a pressure of over 300 mm., was cloudy, showed a fine clot on standing, had a cell count of 675, two-thirds of the cells being polynuclears, contained three times the normal amount of protein, and gave a negative Wassermann and a gold sol curve of 1222344322. The patient died of respiratory paralysis about thirty minutes after the lumbar puncture. The patient had received two injections each of 0.5 gram salvarsan, the first twelve days before death and the second four days before death. This case was probably an acute spreading myelitis ascending in character with definite meningeal involvement. A possible etiologic factor is suggested in an arsphenamin reaction somewhat analogous to encephalitis hemorrhagica.

Curschmann, H. Familial Spastic Spinal Paralysis. [D. Arch. f. kl. Med., Vol. CXLII, Nos. 1, 2.]

Curschmann presents cases of the rare combination of hemolytic icterus and familial spastic spinal paralysis. In one case the spastic spinal paralysis was hereditary though this is one of the rare heredodegenerations. There is here probably not a typical combination of two

disease conditions nor a clinical picture due to one single agent but an accidental coincidence of two quite different diseases arising on the basis of a constitutionally weak germ plasm. On this assumption splenectomy which otherwise would have been resorted to was rejected since it could have no beneficial effect upon the spinal process. Late eunchoidism in the form of eunuchoid distribution of fat, shrinking of penis and testicles and alteration of the sella turcica were observed as signs of disturbances of internal secretion. Two other cases of hemolytic icterus manifested marked infantilism, hypogenitalism and an unusual hypoplasia of the skeleton. The signs of endocrinous disturbance with hemolytic icterus are coördinated symptoms of degeneration.

Platt, H. Early Mechanical Treatment of Acute Anterior Poliomyelitis. [Brit. Med. Jl., February 16, 1924.]

The treatment outlined by Platt consists of complete rest; the prevention of deformities by the adoption, from the moment immobilization is effected, of certain standardized positions of the limbs—positions which are known to be antagonistic to the occurrence of the common contractures, and relaxation of the paralyzed muscles.

Flatau, E., and Sawicki, B. Spinal Tumors. [Lyon Chir., February, 1924. J. A. M. A.]

In two of Flatau and Sawicki's three cases the tumor was in the vertebra and had invaded the spinal cord. In the other case, the tumor was in the cord and had invaded the vertebrae. The tumor was excised and the region was exposed to the roentgen rays. The patients are in comparative good health now, five and nine years since the operation. In the third case, the primary tumor was in the ilium and was inaccessible. The metastasis in the spine, five years after the first symptoms, had induced total spastic paraplegia of the legs, with edema and eschars, and the consultants warned against operative intervention. But the paralysis and edema subsided after removal of the tumor, plus irradiation, in 1922, and the man, now fifty, has regained his earning capacity.

Finzi, A. Neurological Experience with Phlogetan. [W. kl. Wschr., No. 22, 1924.]

Two paretics and one case each of spastic spinal paralysis and multiple sclerosis among seven cases treated with phlogetan showed subjective and objective improvement.

Royle, N. D. New Operative Treatment of Spastic Paralysis. [Med. Jl. Australia, January 26, 1924. J. A. M. A.]

Experiments were made by Royle to determine the function of the sympathetic fibers going to voluntary muscles, and whether that function had any relationship to the abnormal muscular condition seen in spastic paralysis. He found that removal of the left abdominal sympa-

thetic trunk did not interfere with the animal's ability to control the left lower limb, but the animal when placed on its back was not able to maintain the limb in an extended position and the amplitude of the tendon jerks was diminished. The hypertonicity and the flexion following transverse section of the cord were profoundly altered. In contrast to the right lower limb the left limb fell into extension and abduction under the influence of mechanical factors, while the knee and ankle jerks were less active. On the basis of his findings Royle considered it justifiable to test the therapeutic value of the observation and to endeavor to find some relief for the rigidity accompanying spastic paralysis in the human subject. A willing patient submitted to operation. The white ramus from the second lumbar nerve was divided and the grey rami going to the second, third and fourth lumbar nerves were avulsed. The sympathetic trunk was divided immediately below the fourth lumbar ganglion. By this means the grey rami communicantes to the fifth lumbar nerve and to the sacral nerves were divided. Fifty-four days after operation the patient improved to such an extent that he relaxed the formerly spastic limb almost in a normal manner when walking. The knee jerks were practically equal on both sides. The ankle clonus was still present in a definite form on the left side, but was not present on the right side nor was there any sign of abnormal tone in the muscles of the right lower limb. A second patient who had had spastic hemiplegia on the right side for fourteen years was also operated on. The upper limb was useless. The grey rami to the whole brachial plexus were avulsed. Since the operation (two weeks) there has been a remarkable gain in voluntary control in this useless hand and there appears no reason why improvement should not continue when the structural deformities become lessened. The name given to this operation is sympathetic ramisectomy.

Christiansen, V. The Cervical Spinal Cord. [Annales Méd., January, 1924.]

Christiansen deals with affections of the cervical spinal cord and its roots. Careful examination of a supposedly peripheral neuritis may reveal one of the four typical radicular syndromes, and thus allow an early operation. Arthritis of the cervical vertebrae may produce symptoms similar to those of tumors. It is, however, usually unilateral, does not compress the cord, is favorably influenced by extension of the patient, and causes no changes in the cerebrospinal fluid.

Friedman, E. D. Increased Intracranial Pressure. [N. Y. Med. Jl. & Med. Record, October 3, 1923. J. A. M. A.]

In the examination of about 3,000 cases, of which 750 were examined for evidences of injury or pathology, evidences of intracranial pressure were observed by Friedman in about 75 per cent. Roentgenologically, intracranial pressure can be divided into acute, subacute and chronic. The acute type can readily be interpreted by observing a peculiar mottling

of the skull field, better described as areas of increased illumination with intervening spaces of the normal brain shadow. This appearance justifies the diagnosis of a diffuse mild form of edema of the brain. This edema may arise not only from injury, but also from laceration of the brain which occurs in concussion. In every case in which lumbar puncture was performed shortly after an injury, bloody spinal fluid was found even though there was no evidence of a fracture. The subacute type of intracranial pressure is observed at a more remote period after an accident and is accompanied by certain subjective symptoms such as headache and vertigo.

Schall, L. The Tübingen Epidemic of Heine-Medin's Disease. [München. med. Wchnschr., LXX, 763–765. Med. Sc.]

Schall, of the Tübingen University Children's Clinic, describes an epidemic of 139 cases of Heine-Medin's disease which occurred in the Tübingen district during 1922 at the same time as similar epidemics in Hesse, East Prussia, Baden, and the Rhine district. During the period January to May six prodromal cases occurred, but the actual epidemic did not begin till the middle of May, and the great majority of the cases occurred in the summer months. Among 90 cases in which details of the onset were available 83 commenced like an acute febrile disease with a high temperature, 44 had a frequent cough, 40 headache, 15 opisthotonos, 13 general hyperesthesia, 9 pain in the limbs, and 8 pain in the back. Meningeal symptoms were pronounced in 13 cases. Gastrointestinal manifestations occurred in only 2. Paralysis developed in 107, 3 were examples of the purely meningeal form, and 2 of the cerebral form characterized by general convulsions. There were 25 abortive cases, in which the diagnosis of Heine-Medin's disease was established by their association with paralytic cases. The paralysis as a general rule, affected the limbs; one extremity was affected in 40 cases, two extremities in 31, three in 10, and all four extremities in 9. The nuchal muscles were involved in 7, the abdominal in 5, and the back muscles in 2. The bladder and rectum were affected in 4 cases during the paralytic stage. In the bulbar cases the facial nerve was paralyzed 7 times, the hypoglossal 4 times, and the spinal accessory once. The eye muscles were involved twice, and the speech center once. Fourteen cases were fatal, including two of the purely meningeal and one of the cerebral form. As the mortality was reckoned only on the paralytic cases, the last three cases were excluded, so that there were 11 fatal cases, or a mortality of 10.3 per cent. The principal feature of the epidemic was the influenza-like character of the initial symptoms, viz. fever, headache, and dry cough, not only at the onset of the epidemic but throughout its course. In abortive cases in which paralysis did not develop the diagnosis from influenza was impossible. In this connection an outbreak of the disease in an infant's home at Tübingen is of interest, especially as epidemics of Heine-

Medin's disease in institutions are uncommon. In the course of a month 14 children, 3 of whom subsequently developed paralysis, showed more or less considerable rises of temperature associated with symptoms of influenza, such as redness of the fauces, cervical adenitis, and frequent cough. Schall agrees with Wernstedt that the form of Heine-Medin's disease accompanied by paralysis constitutes a relatively small proportion of the total number of cases, and points out that the predominance of abortive cases accounts for the spread of the disease, although he does not deny the possibility of dissemination of the disease by healthy carriers. He recommends that in epidemic times the public should be warned of the danger of the apparently harmless "influenza" case. [J. D. Rolleston.]

Barré, J. A. The Pains with Compression of Spinal Cord. [Presse Méd., May 19, 1923.]

A comprehensive discussion of the significance of pains above and below the lesion, and the interpretation of those for which the cord itself, the sympathetic nerve, or the roots are responsible.

Wideröe, S. Dislocation of the Fifth Lumbar Vertebra. [Norsk. Mag. f. Laeg., July, 1923.]

Five cases of traumatic displacement of the body of the fifth lumbar vertebra in relation to the sacrum are here recorded. In three treatment by extension was sufficient to effect partial or complete recovery. In the remaining two cases he performed Hibb's bone-grafting operation, securing the last lumbar vertebra to the sacrum by bony union. Complete restoration to health was achieved in both cases. Referring to the literature of spondylolisthesis, the author notes that as early as 1890 Neugebauer was able to collect 101 cases, only 47 of which were correctly diagnosed during the patient's life. Hitherto this condition has been much neglected, and while obstetricians have long been familiar with it as a cause of obstructed labor, surgeons have not paid it the attention it deserves. Yet by the aid of a bone-grafting operation, such as Hibb's or Albee's, the distressing pain and general invalidism of this condition, which is often due to a sudden strain or fall, may be completely banished.

Levick, G. Murray. Electrical Treatment of Infantile Paralysis. [The Journal of Bone and Joint Survey, April, 1923.]

Dr. Levick contends that the most important factor in the electrical treatment of muscles affected by anterior poliomyelitis has escaped notice. This factor is the preservation of contractility in the muscles. If adequate electrical treatment is not given, the atrophy of the muscles is greater and is usually accompanied by loss of contractibility of some degree. The author contends that his observations are supported by the accepted theory of muscle contraction which has been put forward by Shaffer. When a muscle contracts, the clear contractile substance passes into the tubes of the sarcous element which are elastic and are dilated by

its entry. As long as a muscle remains in a state of complete relaxation, the tubes remain constantly contracted. It appears to the author that the atrophy following paralysis, besides causing absorption of the contractile substance, is accompanied by a loss of elasticity of the sarcous element and the tubes can no longer dilate to a proper extent for the contraction of the muscle. The author admits, however, that relaxation of the paralyzed muscle is far more important even than electrical treatment. Directions for giving adequate electrical treatment are supplied and the author illustrates these by reference to patients whom he has treated.

Kohlbry, C. O. Birth Hemorrhage into Spinal Cord. [Am. Jl. of Dis. of Children, Sept. 1923.]

In this breech presentation case hemorrhage took place into the cervical cord. There were no other evidences of hemorrhage. The phrenic nerves functioned. The child showed the typical picture of cervical cord injury. The breathing was entirely diaphragmatic, there being paralysis of the thoracic and abdominal muscles. The legs were paralyzed. As a result of bladder paralysis with back pressure, the child developed double hydroureters and hydronephrosis. Infection of bladder and kidneys resulted. Necropsy revealed a complete degeneration of the cord in the lower cervical region.

Caprioli. The Surgical Treatment of Infantile Paralysis. [La Ped. April 1, 1923.]

Caprioli says the aim of treatment in postparalytic equinovarus is (1) to reëstablish the equilibrium of the antagonistic muscles, and (2) to bring the foot back into the best possible position. Whereas many surgeons prefer to straighten the deformity first and then deal with the muscles by transplantation of tendon, or otherwise, the author says that he gets better results by first treating the muscles and tendons, and then, three or four weeks later, he proceeds to forcible straightening. This is done in four stages: (1) Dorsiflexion of the foot, (2) external rotation with the os calcis fixed, (3) forcible pronation, and (4) straightening of the plantar arch. Photographs are given of the various manœuvres, and details of 8 cases so treated are added, with bibliography of 36 references to recent literature on the subject.

Etienne, G. Serotherapy in Acute Myelitis. [Bul. d. l'Ac. d. Med., July 24, 1923. J. A. M. A.]

Etienne reports extremely favorable results from the poliomyelitis antiserum prepared at the Paris Institute Pasteur, and administered in eight cases. Myelitis in adults seems to be prevailing in epidemic form, and in his two fulminatingly acute cases the serotherapy arrested the disease and the symptoms began to subside the next day. In the less acute cases the diagnosis was not made so promptly, and treatment was

not begun till the fourth day or later. The effect was good, but slower in becoming manifest. The interval in three cases was 18 days, 2 months, or 11 weeks after the onset, but the benefit was unmistakable, although not apparent for 6 or 7 days. He gives the details of a number of other cases in which no serotherapy had been given. They all ran a very severe course, testifying to the gravity of the disease in the present epidemic. In one woman the myelitis had been ascribed to syphilis and treated accordingly, and she now has complete paraplegia.

Regan, J. C., Litvak, A., and Regan, C. The Colloidal Gold Reaction in Acute Poliomyelitis. [Am. J. Dis. Child., XXV, 76–84. Med. Sc.]

The writers studied the cerebrospinal fluid in 42 cases of acute poliomyelitis at the Kingston Avenue Hospital, New York, by the colloidal gold test, 132 spinal fluids being thus examined at intervals from the fourth to the eighty-fourth day of disease. The results were as follows: in no instance was a normal reaction obtained in any poliomyelitic fluid taken during the first three weeks, which corresponded to the very acute period of the disease. The reduction was constantly in the zone of low dilutions or so-called syphilitic zone. In 88 per cent of the fluids examined the reaction occurred in the first six dilutions between 1:100 to 1:320. In 14 spinal fluids from patients, who showed more or less marked polyneuritic or meningeal symptoms or pronounced paralysis, the reaction extended to the seventh dilution (1:640). The average curve was highest in the first and second weeks and then gradually declined, reaching an almost normal level by the eighth week. Cases with an early subsidence of the positive reaction from the third to the seventh week were with types of the disease in which polyneuritis, if any had been present at all on admissions, rapidly disappeared; convalescence occurred early and complete recovery took place. On the other hand, in the more severe cases with extensive paralysis the curve remained high till the eighth week or later. The type of reduction in the spinal fluids of the fatal cases closely resembled that found in the nonfatal cases, so that the reaction did not possess any prognostic value. As regards a relationship between the cytology and chemistry of the spinal fluid and the gold colloid reaction it was found that the amount of globulin bore no relation to the height of the colloidal gold curve. A high curve was often associated with a low or absent globulin reaction, or vice versa, a high globulin reaction was found with a low curve. Nor was there any definite relation between the height of the gold chloride curve and the number of cells per cubic millimeter in the spinal fluid, the gold curve remaining high for several weeks after the cell count was normal. The subsidence of the colloidal gold reaction was usually associated with improvements in the general condition, the paralysis, meningeal symptoms, and polyneuritis. In conjunction with the history, symptoms, and other laboratory data the colloidal

gold reaction may be of diagnostic value, especially as it is far more constant and persistent than either the cell or globulin increase.

Williams, Tom A. A Growth Within the Spinal Canal Compressing the Cord and Roots Localized: Operation: Recovery. [W. Va. Med. Jl., 1923.]

A woman of thirty-nine had a progressive loss of power in the legs with gradually increasing severe pains for three months. Pain in the back, and tingling as high as the lower abdomen was also present. A uterine cancer(?) had been removed by radium three months previous to this. The same surgeon had reopened the abdomen in November because of the intensity of pain, after finding nothing abnormal with the X-rays, but nothing pathological was found. Patient was wasted, moved the left leg with difficulty and the foot not at all. There was marked atrophy of the left calf, and the lower part of the left thigh. The left toes could be flexed but dorsiflexion was almost absent. Reflexes of the left leg were feeble, and on the right the patellar reflex was much exaggerated, and there was ankle clonus, although the toes flexed on stroking the sole. Abdominal reflexes were overactive. Some indefinite hyperesthesia in the left groin. The diagnosis made was an extramedullary neoplasm implicating the third, fourth and fifth lumbar roots on the left, and compressing the spinal cord at a level as high as the third lumbar segment. In view of the history, this was of course believed to be a metastasis from the uterus. Operation was performed and revealed the dura mater bound down by a mass the size of a large bean at the level of the third lumbar segment. Neither roots nor cord were infiltrated and no xanthochromia appeared in the spinal fluid below.

The growth proved to be a hemorrhagic pachymeningitis. In part of the first lumbar vertebra, which appeared soft to the surgeon, no abnormality was found. Sections from the small discolored piece of tissue show chronic inflammatory reaction with some hemorrhage and necrosis. Careful search fails to reveal any evidence of a primary or metastatic malignant condition. No evidence of any infectious agent could be demonstrated in the tissues. Recovery is still progressing. [Author's abstract.]

Bériel, Branche, J., Devic, A., Viret and Wertheimer, P. Intraspinal Tumors. [Lyon Chir., April, 1923. J. A. M. A.]

Bériel and Viret discuss, with illustrations, two cases of polyneuromas which show that the nervous tumor spread exclusively by nerve tissue, and lingered for years in the spinal roots before entering the spine. When it invaded the spine, it affected only the intradural tissue in the free space between the bifurcation of the two roots, and could easily have been shelled out. The mother tumor in the root could have been excised, and thus have forestalled the invasion of the spine. Neuromatous bunches in the neck had been noted for 13 years in one of these cases. In the other, the right arm had been weak since childhood.

Bériel and Wertheimer explain that mestastasis in the spine of cancers or hydatid cysts in viscera, bones, etc., is almost invariably extradural. One woman, fifty-four, with paraplegia after a year of vague motor symptoms, recovered after the removal of an extradural tumor in the dorsal spine; it proved to be thyroid tissue. When the metastasis induces pachymeningitis, operative measures are generally contraindicated, but under other conditions they should be considered. The intraspinal metastasis may be long in developing; in one woman, aged 46, there was a destructive process in vertebrae from metastasis after mammectomy for cancer, but the paralysis was the work of a circumscribed extradural nodule.

Complications of Intraspinal Tumors.—Besides the symptoms from compression, Devic and Wertheimer analyze the anatomic complications in cord, meninges of vertebrae, and multiple tumors. In Claude's case there was paraplegia at seventeen, then fatal recurrence after a remission for five years. Necropsy revealed six intraspinal sarcomas.

Flexner, M. Dural Epithelioma. [Ky. Med. Jl., July, 1923.]

Clinical history and autopsy findings of a man of fifty-seven. He had a low blood pressure, glycosuria, and difficulty in walking with loss of power in the legs. Wassermann + in c.s.f. Neoarsphenamin was given. In about five weeks the patient died, with evidence of cerebral involvement three days before death. The course was atypical for a brain tumor, but it proved to be a case of dural endothelioma.

III. SYMBOLIC NEUROLOGY.

3. PSYCHOSES.

Mott, F. W. and Hutton, I. E. Blood Pressure in Dementia Precox. [Br. Med. Jl., Jul. 21, 1923. J. A. M. A.]

In their blood pressure studies in 143 cases Mott and Hutton found that in 10 of the cases of katatonic dementia precox, and in 4 of the 27 cases of hebephrenic dementia precox the blood pressure was under 100; whereas in 12 cases of epilepsy, in 15 cases of general paralysis, and in 9 of the 10 cases of congenital imbecility there was not a single case in which the blood pressure was under 100; moreover, in 5 of the 10 cases of katatonia, and 2 of the 4 cases of hebephrenia, the blood pressure was very low, under 90. In not one of the cases of general paralysis was it under 120. The Goetsch test was made in fifty dementia precox cases. Two cases only gave a normal reaction; these had a systolic blood pressure of 122 and 128, respectively. One was a katatonic and the other a simple dementia precox case with congenital defect. Eighteen cases gave a moderate reaction; in 13 of these the blood pressure was 120 or under (minimum 104); in 5 it was over 120 (maximum 130). Thirty cases reacted only faintly; in 25 the blood pressure was

120 or under (minimum 98); in 5 it was over 120 (maximum 136). The test was repeated in cases with a high blood pressure which gave a faint reaction, and the same result was obtained. In several cases it was found that a faint reaction might be intensified by administration of thyroid extract, but without material alteration in the blood pressure.

Zierl. Brain Tuberculosis in Mental Diseases. [Beit. z. patho. Anal., Vol. 71, Heft. 3.]

Tuberculous lesions of the brain were noticed in five out of 370 patients suffering from mental diseases who died of lung tuberculosis. In one of the five cases there was a tubreculous hemorrhagic encephalitis secondary to a miliary tuberculosis; in the other four one or more solitary tubercles were observed. In four cases the clinical picture of the mental disease was unaffected by the brain tuberculosis; only in one case symptoms of brain tumor became associated with the catatonic condition of the patient. In general the existence of a solitary tubercle of the brain should be suspected when in a catatonic patient with lung tuberculosis, epilpetic fits, vomiting, and other symptoms of brain tumor make their appearance. [C. Da Fano.]

Lewis, Nolan D. C. Kidney Malformations in the Mentally Disordered with a Report of a Case of Congenital Cystic Kidneys and Liver. [Amer. Jr. Psych., Vol. III, 1, July.]

Congenital malformations in general such as developmental peculiarities of skull, ears, teeth, etc., are universally conceded to be common among the mentally disordered. However, malformations of the kidneys have been very infrequently reported from psychopathic hospitals and since these organs belong to one of the most important eliminative systems of the organism, it was thought worth while to direct the attention of pathologists and psychiatrists to some of the interesting findings in this field.

This account deals with the pronounced kidney malformation discovered among four thousand four hundred and fifty autopsies on the mentally disordered and examples with numerous illustrations are given of fetal lobulated kidneys, multiple ureters, pelvic kidneys, solitary kidneys, horseshoe kidneys, aplastic kidneys, single kidneys and types of congenital cystic kidneys. Since these autopsies had been performed by several pathologists, the interests of whom were varied, undoubtedly many cases of congenital kidney malformations, particularly those with less prominent defects such as fetal lobulations, multiple ureters, vessel anomalies, etc., were overlooked or escaped mention; therefore a statistical presentation was impossible. After examining the few available statistical accounts from general hospital material, the impression was gained by the author that there is a notably higher percentage of these abnormalities among the insane.

In addition to general considerations one case of psychosis asso-

ciated with tabes dorsalis and bilateral congenital cystic kidneys and liver was reported in full with microscopic findings, thus adding to the literature another case of this rare combination in which the bile capillaries of the liver share with the tubules of the kidneys in a congenital cystic dilatation of massive dimensions. This man had lived sixty-one years with his abnormality which according to the history had not seriously interfered with his mental and physical health, thus escaping for a long period of time the ever present danger of uremic developments, as the functioning kidney tissue is impaired developmentally by pressure and also by secondary irritative and sclerotic changes.

Emphasis was laid upon the possibility of gaining valuable information on the behavior of the human organism as a whole by a thorough analytic survey of the individual's mental and physical functions when the diagnosis of congenital abnormalities or arrests in development of such fundamental organs as the kidneys and liver can be established during life. A series of correlative studies of mental dynamics associated with arrests in the physical development of organs should be of considerable interest, and it is hoped that this paper will initiate such investigations. (Author's abstract.)

Greene, Ransom A. Dementia Precox and Syphilis. [Amer. Jr. Psych., Vol. I, No. 3, January.]

In 2,117 admissions, 495 of which were dementia precox, there were 12 cases of dementia precox with positive Wassermanns and negative spinal fluid. (Menninger.)

Ludlum, Seymour Dewitt. Physiologic Conditions Under Which Insanity Occurs. [Am. Arch. Neur. and Psych., Vol. XI, March.]

The argument is that there can be observed in the separate parts of the involuntary nervous system variations that show a physiologic pattern corresponding to the type of mental disorder, and causative factors can be sought, having in mind those portions of the involuntary nervous system that are changed in tone, using observations of smooth muscle function as the index. Following Gaskell, there are three outflows of involuntary nervous elements, with motor and inhibitory functions controlling all the smooth muscles of the body. They are: (1) thoracicolumbar (sympathetic); (2) midbrain (third nerve); (3) bulbosacral (vagus system, vagus nerve and pelvic nerve). The integrative action can be observed in numerous ways. In 100 cases we used the three physiologic symptoms that are easy to demonstrate, one for each outflow: (1) blood pressure variation (sympathetic); (2) pupillary variation (third nerve and cervical sympathetic); (3) peristalsis, by roentgen-ray pictures of the intestines (tenth nerve and pelvic vagus). This gives physiologic information from all three outflows of the involuntary nervous system. More symptoms with this innervation can be correlated such as red hands, sweaty skin, etc.

The neuromuscular mechanism of the bowels should be correlated with the blood pressures, also the pupillary conditions, examination of the urine, and of the stool. The determining cause may be any type of irritant, such as bacterial or metabolic disturbances, sufficient to upset the physiologic equilibrium of the vagus or sympathetic nervous system. The vast majority of the cases are primarily somatic, the mental symptoms obscuring the origin of the somatic lesion. (Author's abstract.)

Frets, G. P., and Overbosch, J. F. A. Early Juvenile Familial Amaurotic Idiocy. [Nederl. Tijdschrift voor Geneeskunde, LXVII, Sept. 15, p. 1091.]

The writers record a case of the early juvenile form of familial amaurotic idiocy. The family consisted of five brothers and one sister. Three brothers were affected with this disease: it began at the third year of life, and the children died at the ages of five, five and a half, and six years. There was an hereditary taint, and possibly the three affected children were of less good intellectual constitution than the nonaffected ones. Clinically the disease was manifested by epileptiform attacks, dementia, muscular weakness, blindness, and a progressive course: in one there was atrophia retinæ pigmentosa. Anatomically, there was a general swelling of the cell body of the cortical nerve cells: there was also degeneration of the nucleus and of the fibrillæ, a fibril degeneration allied to that of Alzheimer. The retinal neuroepithelium had disappeared. There were great changes in the cerebellum: the granule cells are absent, and the molecular layer is too small: there is increase of the glia fibers. The Purkinje cells show swelling of their cell-body and also swellings of their dendrites and occasionally also of their axons. The case here described corresponds to the type described by Spielmeyer-Vogt. [Leonard J. Kidd, London, England.]

Morse, M. E. The Ductless Glands in Dementia Precox. [Jl. of Neur. and Psychopath., Vol. 3, May.]

M. E. Morse has studied the pathological anatomy of the gonads, pituitary, thyreoid and adrenals in twelve male and fifteen female patients with dementia precox who died under forty-five years of age. From the pathological side there is very little evidence of a primary atrophy of the gonads in dementia precox, with the possible exception when the disease develops on a basis of mental defect. The fibrosis which is sometimes found in the sex glands, is not an isolated change, but is frequently present also in the hypophysis and occasionally in the thyreoid. The atrophy, when present, can be accounted for by the somatic diseases from which the patient suffered. This explanation is not only simpler and less hypothetical than that of a primary atrophy, but it is more in accord with the facts, if they are critically studied. It agrees also with recent experimental and pathological work on the

ductless glands, particularly the gonads. The condition of the endocrines in dementia precox requires more study, but the authors state that there is no one uniform condition of the gonads or other endocrines dependent on the disease process. The main factors which determine the condition of the glands at autopsy, are the nature and duration of the terminal disease, the state of the nutrition and possibly in some cases an underlying defect of development which is expressed in feebleminded-ness or the hypoplastic constitution.

Uyematsu, Shichi. The Platelet Count and Bleeding Time in Catatonic Dementia Precox. [Amer. Jr. of Psych., Vol. I, No. 1, July.]

The author carefully reviews literature in regard to variations in platelet count and bleeding time, tending to show that these are closely related and vary inversely. Fifty normal individuals were selected and average platelet counts and bleeding time determined. The results were 296,000 platelets per c.c. and 5.2 seconds bleeding time. Forty-five cases of catatonic dementia precox were then studied carefully and the average platelet count was found to be 573,000 and the average bleeding time 3.3 seconds. This the author points out is comparable to the results found in hypothyroidism which is then discussed together with some pertinent literature. [Menninger.]

Halbertsma, T. Mongolism in One of Twins and the Etiology of Mongolism. [Am. Jl. Dis. Children, XXV, 350.]

A study of the literature of mongolism reveals that almost nothing is known about the causation. Several authors have regarded the affection as dependent upon diseases of the mother, or as acquired during pregnancy through the operation of other influences injurious to the embryo. Halbertsma describes five cases of mongolism in one of twins, and says that if the condition of the mother during pregnancy were related to the etiology, one should always expect the identical pathologic condition in both twins. Hence an acquired origin of mongolism is declined and the author shows that in all probability mongolism is germinal of origin; he therefore draws the attention on the type of twin birth (one egg or two egg). If mongolism were not germinal of origin, then the occurrence of mongolism in one of twins would be a surprise; a review of the literature revealed fifteen such cases (author's case included), and only two cases of mongolism in both twins.

If, however, mongolism is due to defects inherent to the germ plasm, then the occurrence of mongolism in one of twins is comprehensible, but it will only be possible in a two-egg pregnancy. In accordance with this theory the author was able to show, that in all cases from the literature the two-egg pregnancy was evident (no data about two cases).

If we now consider the cases of mongolism in both twins, the germinal theory makes the birth of these twins possible only in case of one-egg pregnancy. Although a two-egg pregnancy in these cases is imaginable, as the result of the coincidence of two separate eggs both doomed to mongolism, this will occur very seldom, as mongolism in more than one child of the same mother is almost never reported. In this connection, it was interesting that in the only two cases reported the twins were of the same sex. Cases of twin mongols of different sex do not exist. (Author's abstract.)

Heveroch, A. Narcolepsy. [Cas. lek. ceskych., Oct. 11, 1924. J. A. M. A.]

Heveroch's patient becomes quite sleepy every day at certain hours. He does not lose consciousness, but is unable to move. Laughing immediately produces a weakness of the lower extremities. The author localizes the disturbance in the grey matter of the third ventricle. Psychologically there is a faulty connection between the psychic personality and the static motor functions.

O'Brien, J. F. Epilepsy and Hysteria. [Boston Med. & Surg. Jl., January 15, 1925.]

In this presentation a rapid survey is offered of 100 cases, in which many exciting factors are found to take part in producing convulsive seizures and unconscious states. Fright and craniocerebral trauma in his statistics were predominant, exciting causes, but many convulsions were related in some way to infection in persons who were constitutionally defective. He says that phenobarbital and bromids render patients less convulsive and hence more hopeful, and in a small number of cases apparent recovery has followed.

Juarros, C. Etiology of Epilepsy. [Siglo Médico, July 26, 1924.]

A fairly complete historical résumé of the various hypotheses put forth with reference to the epilepsies in which 262 publications of the last decade are analyzed. Sifting them all merely confirms that almost any cause is liable to induce convulsions, but for the convulsions to be epilepsy, there must be some constitutional mental predisposition, and this he ascribes to some developmental defect in the brain.

Schou, H. I., and Stubbe, H. P. Fasting in Treatment of Epilepsy. [Hospitalstidende, January 22, 1925. J. A. M. A.]

Two to six days of fasting on the part of Schou and Teglbjærg's thirteen patients with genuine epilepsy, mostly severe, resulted in a complete temporary suspension of the seizures, fewer attacks of petit mal, and consistent mental improvement. In several cases the effect of the fast

persisted for some time. The ammonia regulation of the acid-alkali balance in six of these patients during the fast showed a marked rise in the regulation curve with wide variations. This quickly ceased when food was given. Large amounts of ammonia were excreted during the fasting period. Charts and the data of each case are included.

Belloni, G. B. Traumatic Epilepsy. [Riv. d. pat. nerv. e. ment., XXVIII, 1.]

The patient had received a penetrating wound of the right temporal region of the skull when three years old and had contracted syphilis at the age of thirty. Thirty-one years after having been wounded and four years after the syphilitic infection, he had a fit of Jacksonian epilepsy. From that moment the epileptic attacks became frequent and later were associated with symptoms of G. P. I. The patient died in status epilepticus a few years afterwards. The macro- and microscopical examination of his brain revealed the presence of mild, though characteristic, lesions of G. P. I., and of an old scar with considerable destruction of the nervous tissue in the inferior portions of the right frontal and parietal ascending convolutions. According to the author this lesion was the cause of the epileptic fits, which, however, might never have appeared if the patient had not contracted syphilis. [C. Da Fano.]

Felsen, Joseph. Laboratory Studies in Epilepsy. 1. Fractional Gastric Analysis. [Arch. Int. Med., Vol. 34, August.]

Complete absence of free hydrochloric acid in the fasting and subsequent specimens obtained over a period of two hours was found in 15 per cent of a series of 53 cases of epilepsy. Of the so-called "non-epileptic" control group (37 cases), 19 per cent showed complete absence of free acid, and further investigation made it seem quite probable that all of these patients were epileptic. The absence of free acid in one patient closely observed for more than one year, seemed to be associated with rapid deterioration. In one patient, the absence of free acid did not seem to be associated with the onset of an epileptiform attack. Defects in the central nervous control of gastric secretion are more likely than local lesions if one is to consider our findings of significance in epilepsy. A replacement gliosis may follow small hemorrhages occurring in the spinal cord during an epileptiform attack. Several authors have reported an absence of free hydrochloric acid in the fractional gastric specimens of cases suffering from combined spinal sclerosis. If true epilepsy should really be due to sclerotic changes in the spinal cord I am of the opinion that the lesions would in all probability be found in the lateral horns of the gray matter in or above the thoracic region of the spinal cord. [Author's abstract.]

IV. SOCIAL NEUROLOGY, RELIGIOUS PSYCHOLOGY, MEDICO-LEGAL, ETC.

3. MEDICO-LEGAL.

Burt, Cyril. Juvenile Crime. [Br. Jl. Med. Psych., Vol. III, No. 1, p. 1.]

These notes represent observations gathered (a) as expert for magistrates, school officers, and other organized groups coming in contact with juvenile delinquents; (b) material gathered in an educational survey, and (c) single cases specially met with. The author summarizes his general paper as follows: 1. Nearly 200 cases of juvenile delinquency, and, as a control series, 400 normal cases, have been individually investigated in parallel inquiries; and the various adverse conditions discoverable in their family history, in their social environment, and in their physical, intellectual, and temperamental status, have been ascertained and tabulated for each group. 2. The tables show a lengthy list of contributory causes. Delinquency in the young seems assignable generally to a wide variety, and usually to a plurality, of converging factors, so that the juvenile criminal is far from constituting a homogeneous psychological class. 3. To attribute crime in general to either a predominantly hereditary or a predominantly environmental origin appears impossible; in one individual the former type of factor may be paramount; in another, the latter; while with a large assortment of cases both seem, on an average and in the long run, to be of almost equal weight. 4. Heredity appears to operate, not directly through the transmission of a criminal disposition as such, but rather indirectly, through such congenital conditions as dullness, deficiency, temperamental instability, or the excessive development of some single primitive instinct. 5. Of environmental factors those centering in the moral character of the delinquent's home and, most of all, in his personal relations with his parents, are of the greatest influence. 6. Psychological factors, whether due to heredity or to environment, are supreme both in number and strength over all the rest. Emotional conditions are more significant than intellectual, while psychoanalytic complexes provide everywhere a ready mechanism for the direction of overpowering instincts and of repressed emotionality into open acts of crime.

Wittermann, E. Criminal Psychopaths. [Münch. med. Woch., Oct. 3, 1924; J. A. M. A.]

Wittermann declares only 17.5 per cent of his criminal cases as insane, while his predecessors had so declared in 76 to 62 per cent. He also believes that a too rich inner life of the expert is a source of danger, because he tunes himself in too easily with the psychic condition of the delinquent. Only results are important, and the inhuman treatment of war hysteria had excellent effects. It also has thrown light on the nature of hysteria.

Rogers, L. Alcohol in Tropics. [Practitioner, October, 1924.]

The use of alcohol in the tropics is to be condemned, this paper states, also that the health of white people in the tropics would be materially benefited if they would abstain from the use of alcoholic drinks.

Stevenson, T. H. C. Mortality of Alcoholism. [Practitioner, October, 1924.]

This paper would show that in England and Wales during the four years of compulsory temperance, from 1914 to 1918, there was a decline of 84 per cent in convictions for drunkenness, and a decline of 88 per cent in the mortality ascribed to alcoholism.

Powell, R. D. Alcohol in Relation to Life Insurance. [Practitioner, October 1924; J. A. M. A.]

One of the liabilities which in Powell's opinion may account for the greater safety of life for a total abstainer from alcohol is that an amount of the drug far short of intoxication may inhibit restraint of elemental passions and lead to indiscretion often resulting in venereal disease.

Mott, F. W. Alcohol in Relation to Insanity. [Practitioner, October, 1924; J. A. M. A.]

Mott's paper is based largely on investigations previously reported on by himself and others. He says: If alcohol is the essential factor in the production of insanity, there will be certain specific indications pointing to the more or less specific action of the alcohol. Even in the absence of a history of alcoholic indulgence, the physical signs and symptoms which point to alcoholism and the cause of the symptoms are much more valuable than any statement made by the patient or even by the friends or nurse. The more definite the signs and symptoms of neuritis, associated with mental symptoms, the more certain can we be that the cause is removable, and the more hopeful is the prognosis. These signs and symptoms of alcohol as the cause *per se* associated usually with microbial toxemia, are found most pronounced in the two conditions of mental and nervous disorder which occur in hospital practice, viz., delirium tremens and polyneuritic psychosis.

Deutsch, Helene. On Pathological Lying. [Int. Zeit. f. Psa., VIII, No. 2.]

Psychoanalytic explanations for pseudologia phantastica are sought by the author. She defines lies of this form as daydreams told to others as reality. All that which is found in the content of the daydream, voluptuous wishes of ambitious or erotic character, is the stuff pathological lies are made of. There is one moment, however, which distinguishes them from daydreams; daydreams are assiduously concealed as something to be ashamed of, while there is an intense urge to communicate pathological lies to others. It is as though there were a plus of

psychic tension which is relieved by communication. Pseudologica phantastica is compared with poetic creation: the close connection of poetic creation with the daydream has been explained by Freud; the purpose of both is to supply what reality fails to give; both are fulfillments of wishes whose origin is in the unconscious. The author finds that, like pathological lies, poetic creations differ from daydreams, in that at their root is the urge for expression. Besides, the element of aesthetic enjoyment as a mode of adjustment is present only in poetic creation.

From the analysis of a young girl in whom the symptom of pseudologia presented itself at puberty, Dr. Deutsch arrived at the conclusion the phenomenon represents the attempt to divert the phantasy life into channels of reality. The patient related that between her thirteenth and seventeenth years she had lived out a remarkable love romance. The hero was a young man with whom she imagined she arranged rendezvous; she passed hours in weeping at his imagined cruelty; kept a detailed diary of imaginary incidents which she persuaded herself were real. The author analyzes this behavior as arising from the patient's infantile fixation on a brother. At adolescence the patient changed her love object in keeping with the repressed brother image (she steadfastly refused to meet the hero of her remarkable phantasy). It may be said the object was a condensation of the repressed and real object, her hero in the actual world being responsible for the circumstance that she lived her phantasy as real. The pseudological content is a direct derivative of the repressed element which has been mobilized by the newly arising sexual requirements and which has assumed a form acceptable to the censor.

Deutsch gives an explanation of this temporary pseudologia of puberty, which she believes is justified by empirical material: The experiences of the infantile sexual life are discarded because of their incompatibility for the new demands of reality, but there still remains a pressure to continue the old forms of adaptation in the form of new experiences. Pseudologia will make its appearance in those situations in which the adolescent individual experiences energetic and real urges to become free of the earlier conditions; the memory traces of past experiences are revived but are now associated with the transference tendencies which have become strong. The wish phantasies thus acquire the character of real experiences. A biologically useful function may perhaps be ascribed to pseudologia; this office is to gradually free the adolescent from the burden of remembrances. Our organism is ceaselessly engaged in the effort to free itself from tension, to bring about an "abreaction" in some way; pseudologia then represents the completion of a psychic process, that is to say the reliving of the reminiscences to relieve the psychic tension—a catharsis it might be called with greater propriety.

The author compares the mechanism of pseudologia to that of hysteria. In both there is return to an infantile experience and the fulfillment of a forbidden wish and in both there is unsuccessful repression. The

repressed wish, in conversion hysteria, takes the form of somatic symptoms, while the affect disappears; the repressed wish, in anxiety hysteria, is displaced and the affect is converted into anxiety; the repressed material returns, in pseudologia, but is attached to a new object not rejected by the censor and the original affect thus secures gratification. It represents a middle stage between psychic health and a neurosis and indicates a vacillation in making the decision between an escape to reality or to a neurosis. While not all cases of pseudologia are pathological, strictly speaking, yet where there is gross and constant pseudologia, continuing throughout life, it may be assumed that there has been an unsuccessful attempt at adjustment and that a neurosis has stabilized itself in this form. The swindler probably belongs to this picture. There seem to be far-reaching analogies between pseudologia and myth formations, as Rank has noted in his "Myth of the Birth of the Hero." *

Newsholme, A. Social Aspects of Alcohol Problem. [Practitioner, Oct., 1924. J. A. M. A.]

Newsholme concludes his paper as follows: If medical and hygienic advice were adopted by every member of the community, compulsory action would not be called for, but this ideal is not attainable in an average population. Even in present conditions so-called restrictive measures imply no serious restriction for the majority of the community, but only for those who are injuring themselves, their families and the nation, in the absence of such compulsion. It is only by increased compulsion in the form of restriction on the sale of alcoholic drinks, backed by the hygienic persuasion of physicians and others, that we can secure reduction more rapidly than at present of the alcoholism which is still a chief cause of crime, disease, destitution and neglect and impoverishment of families in our midst.

Park, S. Treatment of Inebriety and Drug Habits. [Lancet, Sept. 6, 1924.]

In this paper the McBride method is favorably reported upon. It is a method of the combined use of atropin and strychnin, not as a cure but only a help. Given by the mouth, frequently, in small doses, he found the following extremely useful: nux vomica, cinchona, kola, damiana and gentian. Nux vomica by the mouth often gives better results than strychnin hypodermically. With regard to general treatment, ambulatory treatment nearly always fails and institutional treatment is essential. In treating this class of case it is not only a question of what drugs to use, but how to use them, and there is no doubt that the successful treatment of inebriety depends a good deal on the experience of the physicians and the technic employed.

* Translated in Nervous and Mental Monograph Series No. 18.

Book Reviews

Hamilton, G. V. An Introduction to Objective Psychopathology. [C. V. Mosby, St. Louis, Mo.]

It is a long time since we have read so big a book and found so little in it except words.

The book cover tells us that the book is meant to "reflect the importance of effecting psychopathological studies by scientifically formulated methods of research as an essential supplement to the always useful but never quite trustworthy methods of field and clinical observation." This reminds us, as does the book proper, of the desk worker's approach to practical problems, he tells you what he thinks they ought to be instead of observing what they are.

We are inclined to the suspicion that the author is a doctrinnaire; he is evidently not a psychiatrist in the sense of one acquainted with current or past psychiatric experience. Far from sharing Dr. Yerkes' enthusiasms as to the author's commanding place in psychopathology, as evidenced in a very gushing Introduction, from the evidence set forth in this book we would be inclined to call him a fourth rater who deals out a lot of hokum.

Thus his case histories are for the most part a joke. They are glibly worded but as for so-called objective findings there is nothing—everything is put in terms of "conclusions"—judgments, impressions—and such meaningless phrases as "Indirect responsiveness to inhibited urges"—much as an internist might say that a patient's "gastric pain" was due to his "stomach's failure to adapt itself to its environmental contents"—corn bootleg for instance. "Maladaptive habits of response to personal problems or difficulties," this is another wise crack. The book is full of this pompous kind of nothingness. Case 200 is a scream. "Female—Fifth Decade." All of the patients are designated in "decades"—we are not told their actual age—so whether this blushing damsel was just entering fifty or about to pass sixty we are unaware. She is diagnosed as "malingering." This spicy bit of Sherlock Holmesians acumen is offered us (p. 198). "A silly woman who sought to start an intrigue by feigning a most unconvincing collection of nervous symptoms. She was charged a stiff fee and treated with much formality—and never returned to my office." Prunes and prisms! This is a worthy gem for Professor Mencken's Americana. Can we not see this "Adonis" spotting this poor old lady in one interview in her attempt to seduce him. As we gather from the dedication the author is married—what naughty women there are in Santa Barbara or in the Mississippi valley town in which two places these "surveys" were made.

The more one reads the more irritating the false statements become, every page contains some obvious nonsense.

In the first place, in any large polyclinic service in New York City—such as at the Mt. Sinai, Neurological Institute, Post Graduate or Vanderbilt Clinic, nearly 200 cases of the types envisaged in this book can be seen in a week or at most ten days. Much better case records are obtainable in these clinics than any presented in this book. They may not contain so much language but they will be more "objective." From this comparatively insignificant material almost farcically investigated we learn among other things that "the 3d, 4th, 5th, and 6th decades represent the periods in which nervous disorders are especially apt to develop"—why omit the prevalent disorders of childhood and adolescence—and as for senescence we are blithely told (p. 203) "after sixty, *death*[1] and the natural tendency of elderly persons to become less responsive to personal limitations and baffling personal problems are important factors in the reduction of the incidence of the so-called functional nervous disorders." This sentence contains one of the few statements we have found in this book with which we are disposed to agree—namely that "death" is an important factor in the reduction of the incidence of functional nervous disorders. Maybe, however, Mr. Conan Doyle would say it was only the beginning of who knows what functional nervous disorders can take place judging from the profundity of the remarks we are offered from those who have tried this adventure.

We have devoted some space to this book because we hate to see such an undisgested and self-contradictory medley of academic psychology, behaviorism, mental measurement doctrinairism, bad neurology, lay psychanalysis, unblushing exhibitionism and puerile endocrinology, posing as a serious contribution to psychopathology.

Two more bits of rubbish (such are found on almost every page) before we close: (p. 243) "Their cell bodies (*i.e.*, autonomic vegetative nervous system) lie outside the cord, brain, spinal ganglia, cranial nerve root ganglia and sense organs." What about the vegetative ganglion cells in the ventral horns (Jacobsohn), in the medulla (Onuf and Collins), in the diencephalon (Malone), etc., etc.ä

Then read this bit of ambiguity (p. 245): "The heart, the gastrointestinal apparatus and probably the endocrine glands are to an extensive but as yet not exactly determined degree self-regulatory, and by this I mean that they are self-regulatory independently of impulses received from the cranial autonomic, sympathetic and pelvic nerve divisions of the autonomic division of the nervous system."

These are but a few of many illustrations of the author's ignorance of the whole subject which would be amusing rather than annoying if the whole thing were not written with such a fatuous assurance of superior knowledge. He even quotes the German titles for translated works, the citations from which are plainly taken from their Englished forms for in some instances later German editions are available if he could read them. A farmer from Kansas

[1] Italics ours.

could hardly have done worse; this is why, perhaps, Birnbaum in the Münch. med. Woch., calls this work "primitive and naïve."

Weigeldt, Walther. Studien zur Physiologie und Pathologie des Liquor cerebrospinalis. [Gustav Fischer, Jena.]

This masterly small monograph of about 130 pages is specially devoted to a consideration of variations in cell and albumin content in different parts of the c.s.f. system. It thus deals with more than the general problem of the c.s.f. but also with special situations and variations which are of unusual clinical importance and which are usually not known from the run of studies with which we are familiar.

These specific studies dealing with local differences in cell count, albumin content, variations in specific gravity, in Wassermann and gold-sol reactions and in bacteriological findings are all taken up after a thorough consideration has been given to the questions of c.s.f. formation, distribution, mechanics of the fluid and its circulation, its cell elements and its chemistry.

With Greenfield's monograph and this equally excellent treatise one is well equipped to survey the present-day horizons concerning the c.s.f.

Kraepelin, Emil. Arbeiten aus der Deutschen Forschungsanstalt für Psychiatrie in München. Zehnter Band. [Julius Springer, Berlin.]

This admirable collection of papers, 32 in number, indicates the great activity of the workers associated with Kraepelin in his gradually developing Research Institute. With this record of 10 volumes no one can for a moment doubt the immense service to psychiatry that the Institute has done and can do in the future if its future can be made certain.

Peters, W. Die Vererbung geistiger Eigenschaften und die psychische Konstitution. [Gustav Fischer, Jena. Mk. 14.]

The initial stimulus for this work came from the author's Referat before the Eighth Congress of Experimental Psychologists at Leipzig, and it has grown into a book of some 400 pages done in the style that only Fischer of Jena has been famous for for many years.

It is not, however, of interest for its good paper or excellent printing; it has intrinsic merits as a scholarly production.

If eye color, skin structure, bodily form, and Hapsburg noses have come down through many generations in stereotyped form, why may not there be the same principles operative for psychological characters just as Galton, Pearson, Davenport, and many another have shown or attempted to show. Ziehen and Heckel have worked upon musical talent and innumerable studies have developed this or that type of special aptitude, and certainly we as neuropsychiaters are not entirely oblivious to the genetic relationships of color blindness, hemophilia and maybe certain schizoid or cycloid temperamental inheritance possibilities.

The author builds much upon Johanson's application of inheritance principles, a formulation which has clarified many abtruse situations as they have been offered in human genetics. In general the author is fully en rapport with the entire literature; in one point only have we sought to find a consideration of what may be called false heredity, *i.e.*, in the factors of imitation of psychical characteristics which makes such a large chapter in contemporary study of human personality seen from the standpoint of conditioned reflexes, which operating from childhood are of so much significance in the analytic investigation of character formation. The author touches upon this field but does not do justice to it, in our opinion.

Eldridge, Seba. Political Action. [J. B. Lippincott Company, Philadelphia and London.]

Politics does not always center about the village drug store, except possibly on election day, but it also dwells in high places. The factors producing some of its results are of sufficient interest for a group of individuals termed sociologists to attempt to analyze them and thus possibly influence mass behavior, much as physicians might hope to influence a mass collection of leucocytes and other things known as a pneumonic consolidation.

Thus the author subtitles the work "A Naturalistic Interpretation of the Labor Movement in Relation to the State" and we have read it with much interest, even though our ideas along these lines are more or less impressionistic, and more derived from theoretical considerations of mass psychology rather than from any study of actual politics.

From one point of view we welcome the author's laying low on the theory of instincts, especially as advocated in certain quarters. Such are great words in the professional chairs but not of much direct application in the subway, and this work impresses us as having been written by some one who has gotten down to brass tacks and seen the gang on its job. At all events it is a readable book, even if at times a trifle pedantic.

Berkeley, W. N. The Principles and Practice of Endocrine Medicine. [Lea & Febiger, Philadelphia and New York.]

A somewhat labored but yet possibly useful summary of very restricted aspects of endocrine medicine in which the author rests still upon older and now historically interesting hypotheses only. He is strangely unacquainted with the recent literature of the vegetative nervous system as outlined in such works as Lewy, Brugsch, Dresel, Jelliffe and White, Laignel-Lavastine, Pende and others and is content to quote Bayliss, Langley and others as authorities. Pioneers they were, but for some time past pushed aside in the forward rush of a great mass of interesting material. As we read of the various endocrine glands we are struck with the hodge podge character of accumulated statements of various workers in the field without any synthetic point of view, quite in the older style of Sajou's

scissors clipping accumulations of material. The author flounders about in his quotations apparently without any sense of what it is all about. In short he misses the essential thesis that the "body as a whole" in its purposive seeking utilizes its organs for its ends. He hardy does more than catalogue the various organs as disparate types of activity. He never gets them all running together. It seems to us like Ford's shop in Detroit when the belt is not running. In short the author is rich in quotations but he shows no synthetic capacity. The chapter upon paralysis agitans is almost a farce, so little is the author acquainted with the nervous system as studied by Lewy, Jacob, Vogt, Magnus and others.

We would like to say something nice about this book, but the more we read it the worse it seems. It is a mess.

Foix, Ch. et Nicolesco, J. Les Noyaux Gris Centraux et la Region Mésencéphalo-sous-optique. Suivi d'une appendice sur l'anatomie pathologique de la Maladie de Parkinson. [Masson et Cie, Paris.]

This is a classical production both in content and in form which follows the best French traditions. Nothing just like it in the neurological field has appeared since Dejerine's well known Traité or Azoulay's translation of Cajal's well known work.

Two aims have been set forth—the one which occupies the major portion of this 600-page work, namely the anatomy, and the histology of the basal ganglia, subthalamic region and the tuber cinerium while in an appendix the authors discuss the anatomical pathology of Parkinson's syndrome. All this is done in the most minute and complete manner with the most advanced of mechanical aids in the way of excellent bookmaking, fine paper, beautifully illustrated plates in black and white and in colors.

The authors approach the main theme of their work in three sections. They first outline the general anatomy, topography and relations of the regions under discussion; they then give an extended and well-illustrated series of sections in all three planes of the various nuclei and pathways under investigation. Finally they correlate the cytotectonic and myelotectonic features and offer much matter of physiological interest. All of this is done in a manner a trifle didactic but unusually comprehensive. The bibliography is ample at the end of the chapters, but does not form any part of the discussion, hence it is of value only as reference. It does not contribute to enlarge the vision of the student. This is a feature to be somewhat regretted. In spite of this no worker in neuroanatomy can afford to neglect this really very valuable contribution.

The appendix deals only with the senile type of the Parkinsonian syndrome. Others are recognized but the senile type is discussed in the limited frame of reference to degenerative changes although the possibilities of early types of senile alterations producing a Parkinsonian syndromy from unknown infectious origins links up the encephalitic with the senile types. Lewy's thorough studies are

mostly confirmed regarding the pathological anatomy. Here also a fairly complete bibliography is to be found.

The volume as a whole is of the highest merit.

Kraepelin, E., et al. Arbeiten aus der Deutschen Forschungsanstalt für Psychiatrie in München. [Elfter Band. Julius Springer, Berlin.]

Again we have a reminder, and an important and valuable one, of the activities of Kraepelin and his coworkers in the appearance of this eleventh volume containing the results of researches conducted at the Research Institute for Psychiatry in Munich under the leadership of this indefatigable and master spirit of psychiatry.

It is a doughty volume and contains not only reprints of studies already published but also a large number of original contributions not available elsewhere by such well known workers as Spielmeyer, Plaut, Jahnel, Matsuo, Mulzer, Lange and others. There are 40 papers in the volume upon a vast variety of subjects connected with neuropsychiatry. One cannot list them all but they deal with problems of structure as well as of function. Cerebral fat embolisms, miliary necroses and treponema pallida, morphinism, spinal cord necroses, hereditary degenerations, CO_2 poisoning and nervous system, fatigue and work, metabolism and the nervous system, epidemic encephalitis, melancholia, exogene reaction types, clinical psychiatry and heredity, multiple sclerosis, histopathology in the last 50 years, these are but a few of the subjects dealt with.

This series of studies is of inestimable value to all workers in neuropsychiatry.

Roger, G. H., Widal, F., Teissier, P. Nouveau Traité de Médecine. Fascicule, XIX, Pathologie du Cerveau et du Cervelet. [Masson et Cie, Paris.]

In this monumental new Traité de Médecine, vols. 18, 19, 20 and 21, are devoted to diseases of the nervous system, speaking in the narrow sense of sensori-motor and vegetative neurology. The plan apparently does not as yet include the psychoses, *i.e.*, diseases of man's symbolic mechanisms. The volume before us is the first to be completed, save that upon the endocrinopathies which has already been reviewed in these pages. The present volume is a very comprehensive one—it is nearly 1,000 pages.

A quick glance at its contents will reveal what it stands for. Klippel and Monier-Vinard discuss the chief Pyramidal Syndromes, or Hemiplegias; Roussy and Cornil have an elaborate chapter upon Cerebral Hemianesthesia; Velter and A. Weill write upon Hemianopsia; Klippel, upon Jacksonian Epilepsy; Lévy-Valensi, a very thorough discussion of Cortical Syndromies; Klippel and Lhermitte, one upon Subcortical Disturbances. Cerebral Trauma is written upon by Marchand, while Comte contributes the chapter upon Infectious Processes of the Brain. Circulatory Disturbances are written upon by Comte and Klippel, and Roussy and Cornil offer a chapter

upon Brain Tumors. Gougerot has the section upon Cerebral Syphilis, and Lépine that of Paresis. The Encephalopathies of Childhood is written by Lévy-Valensi. André Thomas has a very full section, 150 pages, upon the Cerebellum, and Hautant's contribution to Labyrinthine Syndromes draws the book to a close.

This is a noble list of contributors, most of whom have international reputations.

The reviewer is at a loss to know where to distribute praise or to apportion criticism. The whole work is conceived in the best of French neurological style. Some of the material consists of carefully elaborated, enlarged, and rearranged communications already classical, such as the masterly handling of Roussy and Cornil upon Cerebral Hemianesthesias and Brain Tumors. These are notable contributions to neurology which lie outside of textbook presentations. Thomas' many contributions to Cerebellar Disorders are classical. Here is no repetition of his older work but a most masterly handling of the entire cerebellar situation which is an entirely new monograph.

Lévy-Valensi's touch is always of interest. Here is a master of diagnostic acumen with rare qualities of precise and valuable formulation. Klippel and Lhermitte's discussion of the pallidal and other subcortical syndromes is profound without being heavy, and does justice to the newer interests awakened concerning the many problems of these complicated brain structures and brain functions.

The bookmaking is as worthy of praise as are the contents. Altogether this neurological volume is one that will prove of great service to the student as well as to the specialist. It is easily on a par with the best of the German systems and for the most part superior to all others. It has certain inequalities incident to all systems and here and there falls short of certain monographic presentations. The specialist could point out a large number of deficiencies in certain of the chapters, but these—such as, for instance, the omission of Willis' observations on general paresis—are of but minor importance and do not in any sense detract from the value of the volume as a whole, and only in minor degree from the respective sections.

Eliasberg, Wladimir. Psychologie und Pathologie der Abstraction. Beiheft 35 zur Zeitschrift für angewandte Psychologie. Johann Ambrosius Barth, Leipzig.

The relationships of thinking to speech constitute a most fertile field for investigation in that highly complicated series of evolutionary developments which are incident to man's utilization of symbols as tools. For some years the author has made a number of noteworthy contributions to this general aspect of the thought processes and here presents a useful résumé of his researches. These have dealt with children before the ages of entering school, with so-called normal adults, with academically cultured and developed individuals, aphasics, dements, and, of special import, with patients suffering from brain injuries.

The goal has been to determine the various stages in the develop-

ment of the powers of logical abstraction and to learn in what sense and by what means such evolutionany syntheses are capable of analytic interpretation in the light of disease dissociation.

It is a monograph of nearly 200 pages and is of special value for all who are able to get into complicated problems of logical construction of thought processes. It is not easy reading and will not appeal to the simpleminded who, unaware of the complexities of the issues involved, are content to follow the empty phrases of the scholastic textbooks of their college days, especially those who are wrapped up in the infantile belief that "tests" of "intelligence" are of much significance.

Bernard, L. L. INSTINCT. A STUDY IN SOCIAL PSYCHOLOGY. Henry Holt and Company, New York.

Of all the useful generalizations introduced into biological science by the Darwinian discipline, that of "instinct" has been the most fertile as well as the most baffling.

No one mortal can possibly read all of the many discussions relative to the meaning of this phrase, so widespread has been the interest in the thought and so discursive have been the points of view expressed upon the problems raised.

Here we find, however, a sincere and valiant, as well as scholarly effort to disentangle the many meanings which have been attached to the conception, especially as it has been applied to the social sciences.

The author expressly states that he was dissatisfied with the McDougall concept. This concept, as is fairly well known, permits of a multiplicity of instincts, which, logically speaking, are not carefully differentiated from simpler syntheses of behavior reactions which are more rigorously regarded as habits. The author quotes Dunlap, who, scholastically immersed in etymologies, says he cannot distinguish between instincts and habits. Here Bernard prefers Herrick's effort at distinction, which, as neurologists, we also prefer.

The reader will here find an excellent digest of all of the various points of view, chiefly taken from English students of the problem. In our opinion he demolishes the McDougall conception and gives at the same time a better working series of formulae for the meaning to be applied to the conception of Instinct.

This is the best book we have met with in recent years dealing with this complicated generalization and one which can orient the intelligent reader as no other work of its kind in English.

Müller-Freienfels, Richard. DAS DENKEN UND DIE PHANTASIE. Band II. Grundzüge einer Lebenspsychologie. Zweite Auflage. Johann Ambrosius Barth, Leipzig. 12 marks.

The "foundations of a living psychology"—this is an attractive program, especially to neuropsychiatrists. The author has already presented an earlier volume dealing with this situation under the title of "Das Gefühls und Willensleben," which has received attention in an earlier volume of the JOURNAL.

Here he would deal with those mental manifestations which may be subsumed under the titles of "Thinking" and "Phantasy"—or as in general already partly presented to psychiatrists as "directed thinking" and as wish-fulfilling or autistic thinking, as Jung and Bleuler have designated them and here termed "phantasy." Not that our author would be satisfied with these signposts, for he here presents a very systematic analysis of the entire scheme of thought processes, more or less in the orthodox regimes.

Thus he sets forth in his Introduction the notion of the "Ego" and the intrinsic patterns of the strivings for self-preservation and for development in which environmental circumstances play a necessary and important rôle. Hence arise "pleasure and pain" and the idea of "values."

Coming to grips with his problem, he discusses "perception" in its analytic and then in its synthetic function. Thus arises "ideation" and "presentation," which finally build up conceptual thinking. These questions occupy the first section of 250 pages.

He then advances in the second section, chapter 1, to "constructive activities" of "Thought" and "Phantasy," in which he discusses, among other themes, the free movement of consciousness, dissociation, impulse, and goes on to diifferentiate the chief types of "Thinking" and "Phantasy," "Conscious and Unconscious." Chapter 2 deals with the impulse to thought and the setting of the thought "object."

Further chapters deal with the constitution and elaboration of the thought object and the solution and verification of the problem, while a final section deals with considerations of the theory of knowledge.

The whole volume is filled with provocative ideas, and apart from difficulties of a foreign language presentation is one well qualified to be of distinct service in psychology.

Winterstein, H., Grund, G. Methoden zur Untersuchung des ueberlebenden Zentralnervensystems. — Methoden zur Funktionsprüfung von Muskel und Nerven beim Menschen mittels des galvanischen und faradischen Stromes. [Urban & Schwarzenberg, Berlin u. Wien.]

Abderhalden is editor of this Handbook of Biological Methods, of which these two sections constitute No. 188. It is a gigantic scheme, this work of at least 600 coworkers.

The present volume contains two sections, one upon animal experimental methods working on various parts of the animal body separated from the living animal. Artificial circulation is dealt with first, then study of isolated functions of the nervous system, and the study of body fluids of necessity for nervous functioning. These are taken up in detail.

The second two-thirds of the volume deal with functional nerve testing. It is an excellent short summary of the usual tests made by galvanic and faradic electrical currents. The newer French work of Lapicque and Bourgignon is dealt with in about three pages.

Garcia-Diaz, Guillermo. Etude analytique et synthetique de la Sympathectomie Périarterielle appliquée au traitment des Ulcéres chroniques des Membres Inférieurs. [Libraire Le François, Paris.]

An Argentine-Republic surgeon, a graduate of the Paris faculty, has written this very interesting and elaborate monograph upon the treatment of chronic ulcers of the leg by periarterial sympathectomy.

From its dedications we infer that it is his "doctor" thesis, but it evidently is the work of one who has had more experience than the usual medical graduate.

The thesis follows the usual lines, taking up the history of the operation, the morpho-physiology of the vascular innervation, operative technic, immediate and after effects of operation, risks and accidents, the study of the mechanisms involved in the operation, and a final chapter on the therapeutic value.

There are those who think of this type of work as having originated with Leriche and Jaboulay, but the attack upon the vegetative nervous system began back in the middle of the 18th century. In the latter part of the 19th, cervical sympathectomy "cured everything," and now the end of the rope—*i.e.*, the periarterial vegetative network—has come and the surgeons offer a new millennium. This historical chapter gives a quick orientation to the work done. The histology of the nerve net is not very satisfactory. It is so much more complicated than figured or conceived of by the author. The newer Spanish work is not thought of, and this is the most unsatisfactory chapter in this very excellent thesis.

There is a large amount of clinical material put under discussion and a very conservative attitude is taken; in fact, the author comes to the general conclusion, after having studied about 500 cases, that periarterial sympathectomy is not a good procedure; in fact, surgical interference of this type is to be deprecated.

He would substitute certain forms of electrotherapy or actinotherapy in order to bring about the needed vascular dilatation and stimulus to cicatrization.

Henning, Hans. Psychologische Studien am Geruchsinn. [Urban & Schwarzenberg, Berlin u. Wien. Marks 4.50.]

There is no greater authority to-day upon the sense of smell than Hans Henning of Danzig. We have had occasion to call attention to his monumental monograph published in 1924, and Abderhalden in this No. 189 of his Handbook of Biological Methods has been fortunate in getting this very condensed and well written chapter upon the psychological methods of studying the sense of smell.

Notes and News

The Fifth Annual Convention of the Central Neuropsychiatric Association was held at Cincinnati, Ohio, on October 29 and 30. Clinical presentations, pathological demonstrations, and addresses were made by neurologists and psychiatrists in Cincinnati. The presidential address was delivered by Dr. Albert M. Barrett, of Ann Arbor, Michigan, on Neuropsychiatric Interrelationships. Dr. August Wimmer, Professor of Psychiatry and Neurology of the University of Copenhagen, was the guest of honor and delivered two addresses, one on the Clinical Aspects of Kleptomania, and one on Epilepsy in Chronic Encephalitis.

Officers for the ensuing year were elected as follows: President, Dr. Walter D. Shelden; Vice-President, Dr. Alvin T. Mathers; Secretary-Treasurer, Dr. Karl A. Menninger; Counsellor, Dr. Albert M. Barrett.

The Annual Meeting of the American Neurological Society will be held May 24, 25, 26, 1927, at the Hotel Ambassador, Atlantic City. Titles of papers must be in by March 31, 1927.

On July 25, 26, 27, 1927, the American Neurological Society will hold a joint meeting with the Section of Neurology of the Royal Society of Medicine in London, England. Dr. C. L. Dana of New York will give the Hughlings Jackson Lecture July 27, 1927. Members of American Neurological Society are requested to hand in titles of papers before March 31, 1927.

N. B.—All business communications should be made to Journal of Nervous and Mental Disease, 64 West 56th St., New York.

All editorial communications should be made to Dr. Smith Ely Jelliffe, Managing Editor, 64 West 56th St., New York.

Vol. 65 MARCH, 1927 No. 3

The Journal

OF

Nervous and Mental Disease

An American Journal of Neuropsychiatry, Founded in 1874

Original Articles

THE MALARIA TREATMENT OF GENERAL PARESIS

By Armando Ferraro, M.D., and Theodore C. C. Fong, M.D.

ST. ELIZABETHS HOSPITAL, WASHINGTON, D. C.

The favorable influence of infectious diseases on the course of the psychosis, and presumably on general paralysis, was well known in the last half century. Reuss, Rosenblum, Jacobis, L. Meyer, Sciamanna, and others were already acquainted with the beneficial influence of high temperature accompanying infections and a treatment so directed as to produce an increase in the temperature was established by Wagner v. Jauregg and Pilcz, who used injections of tuberculin, while Donath, Fischer, and others used natrium nucleinate. The idea, however, of producing artificial infectious diseases in mental patients was first tried in 1875 by Rosenblum, who inoculated patients affected by different types of psychoses with relapsing fever organisms. It is doubtful if among these patients there were any paretics, and Plaut and Steiner, who have reviewed the cases, deny it. The results obtained by v. Jauregg, Pilcz, Donath, and Fischer were found satisfactory, as Pilcz reported 60.3 per cent of remissions with the tuberculin therapy and Donath 47.6 per cent with the sodium nucleinate treatment.

We are, however, indebted to Wagner v. Jauregg for his original experiment of inoculating paretics with malaria, the results of which were reported in 1887 in the Jahrbücher für Psychiatry, Bd. 7. In 1917, v. Jauregg started a new experimental work by inoculating nine patients, four of whom were beneficially influenced by this new mode of treatment. The attempt of the Viennese school to treat paresis with malaria was followed up by that of the school of Monaco (Plaut and Steiner) (1919), who treated general paresis by artificial infection produced by the spirochetes of the relapsing fever.

Encouraged by his first results, v. Jauregg instituted this treatment on a larger scale. In other cities of Austria, in Germany, in England, and in other countries additional contributions were made, dealing with the efficacy of this new type of treatment. To-day this method of treatment has become widespread and in many large institutions extended experiments have been carried on. In this country, St. Elizabeths Hospital was among the very first to adopt this new form of therapy, and the results of a first series of cases so treated have already been published by Dr. Eldridge and his coworkers. This paper will consider the results of this treatment on the entire series of cases, considering them mainly from the clinical point of view, the serological results having already been described in a previous paper.

A careful survey of the literature on the subject has given us statistical data reported by many authors who have studied this subject, and we have incorporated this data in the accompanying table:

TABLE I

Results of Malaria Treatment of General Paresis According to Various Authors

Author	Year of publication of the paper	No. of cases	Very good remissions %	Incomplete remissions %	Unimproved %	Deaths %
Wagner v. Jauregg	1917	9	44			
Gerstmann	1920–21	25	28	44		
Delgado	1921	5	40	60		
Kirschbaum	1922	39	25	17		
Weygandt	1922		68	20	12	
Gerstmann	1922	116	35.1	30.96	22.36	10.32
Pilcz	1923	141	35.7	12.6	39.9	10.5
Drought and Beccle	1923	14	21.3	56.8		14.2
Aguglia and d'Abundo	1923	4	50			
Scripture	1923	141	43.4			
Gans	1923	17	23.2	5.8	40.6	5.8
Herman	1923	40	20	27.5		
Grafe	1923	19	62.4			
Gerstmann	1923	294	38.08	30.60	31.28	
Kirschbaum and Kaltenbach.	1923	175	31.1	31.4	22.9	14.2
Grant	1923	40	22.5	7.5	12.5	15
Nyirö Gyula	1924	30	23	40	20	6.6
Artwinski	1924	70		46	40	14
Herzig	1924	100	15	12		
Schulze	1924	250		44	12	6.9
Horn	1924	58	58			

Author	Year of publication of the paper	No. of cases	Very good remissions %	Incomplete remissions %	Unimproved %	Deaths %
Askgaard	1924	37	32.4	21	32.4	
Reese and Peter	1924	236	20	50.6	29	10.6
Bratz	1924	40	27.5			
Kirschner and v. Loon	1924	4	25	50		
Jansen and Hutter	1924	27	37	29.6	44	22.2
Untersteiner	1924	40		40	22.5	
Modena and De Paoli	1924	8	25	25	25	25
Jossman and Steenarts	1924	100	21	28	39	12
Schuster	1924	55	23	11		
C. Meyer	1924	63	50			
Yorke and Macfie	1924	84	27.37	32.13	23.80	16.6
Plehn	1924	40	33	33		
Scherber and Albredst	1924	15	13.2	52.8	33	
Grant and Silverston	1924	50	14	66		14
McBride and Templeton	1924	18	16.5	44	22	16.5
McAlister	1924	9	22	44		
Grossman	1925	8	37.5	25	12.5	12.5
Kihn	1925	16	20.4	34	34	20.4
Scarpini and Befani	1925	7	42.6	28.4		28.4
Lilly	1925	36	27		40.5	8.1
Davidson	1925	53	16.2	30.6		
Wizel and Prussak	1925	22	40.5	9		9
Eldridge	1925	68		25.2	29.4	
Gerstmann	1925	400	33	14.25		
Sagel	1925	115	47	17		
Mingazzini	1925		40	20		
G. M. deRudolph	1925	31				
Graham	1925	50	36	14		
Hermann	1925	60	17.6	36.8		
Cortes	1925	14		56.9	35.5	
Donner	1925	30	30	29.3	30	
Bunker and Kirby	1925	39	45			15
Nonne	1925	450	30			8–12
De Paoli	1925		31–35			
Pastrovitch	1925	91	23.2	38.5	22	8.8
Fribourg-Blanc	1925	3	66			33
Grimme	1926	36	26	20.8	28.5	13
Nicolle and Steel	1926	77	15.6	20.4		
Bosch and A. No	1926	40	17.64	29.41	20.58	2.5
O'Leary	1926	24	25	37		5
Nerancy	1926			45	40	10
Bunker and Kirby	1926	106	34.9	20	24.5	10
H. and A. McIntyre	1926	40	8.20	32	17.5	10

There are several points concerning the clinical course of artificially induced malaria which must be taken into consideration before disclosing the results of the treatment. One of the first points is the period of incubation of the artificial infection. It is well known that the period of incubation of naturally acquired malaria (benign

tertian) is from nine to twelve days, according to Castellani and Chalmers. The incubation period of artificially induced malaria is somewhat different and varies with the method of incubation, depending on whether it be subcutaneous, intravenous, intramuscular or by mosquito-bite inoculation.

According to Gerstmann (1924) the period of incubation by subcutaneous means of inoculation is from four to twenty-eight days. Scripture (1923) states that the period is from six to thirty-one days. Donner (1925) reports from five to twenty-one days, while York and Macfie (1924) says the incubation requires from eight to fifteen days but with considerable variations. Pijper and Russell (1924) state a period varying from nine to eighteen days and McAlister (1924) gives from nine to thirty-two. Grant and Silverston (1924) in a series of forty-three cases noticed that the initial rise in temperature occurred from one to eighteen days after the inoculation whereas parasites were first found in the blood stream from six to twenty-two days. After infection Kirschbaum and Kaltenbach found the incubation period varying from eight to fourteen days to a maximum of four weeks. Dattner and Kauders occasionally found a period of twenty-one days while the average was from six to eight days, Nyssen found the average to be eleven days, and Fribourg-Blanc ten days. The work of Wizel and Prussak shows that from seven to twenty-one days of incubation are required and Eldridge's cases from seven to thirty-four days. The longest incubation period was reported by Mühlens and Kirschbaum and was fifty days.

By the intravenous method of inoculation, Ronald Ross cites the details of six intravenous inoculations with benign tertian malaria. In these cases, fever first appeared in from three to twelve days following inoculation. Templeton (1924) found in twenty cases of dementia precox inoculated intravenously with 2–3 c.c. of malarial blood that the temperature rose the day following inoculation. MacBride and Templeton found that pyrexia usually developed on the second or third day in a series of eighteen general paretics. Davidson (1925) in a series of sixteen cases found that the incubation period varied from four to nineteen days. Mühlens and Kirschbaum found the incubation period varied from three to twelve days. The incubation time of Nyssen's cases averaged four days and that of Fleck three days. Dattner and Kauders state that intravenous inoculation shortens the time from one to three days.

According to de Rudolph, if the same strain of parasites are used,

there is a tendency for the incubation period to be slightly shorter with the intramuscular type of inoculation than with the subcutaneous. Davidson, however, finds that the differences are very slight, the time being essentially the same for intramuscular and subcutaneous inoculations.

For malaria artificially induced by means of the mosquito bite, de Rudolph found that in thirty-seven cases the incubation period varied from seven to twenty-five days if measured by the first rise in temperature, and in thirty-four cases from seven to thirty days if the first appearance of parasites in the blood was regarded as the measure.

The technique initially employed at St. Elizabeths Hospital was to inject into the subscapular connective tissue by means of a hypodermic syringe 2 c.c. of blood withdrawn from the donor patient shortly after a paroxysm. The recipients were then sent to a ward which was well screened, and confined there until the treatment was completed. Lately, the intravenous mode of inoculation has been used and at present patients are inoculated by this means. The donor patient is always one with a negative blood Wassermann and with no syphilitic history.

Our data concerning the period of incubation as found in the entire series is as follows:

Subcutaneous inoculation. The period varied from a minimum of two days to a maximum of forty-eight. Of the entire series, seven cases showed an incubation period of more than thirty days, while ten showed an incubation period of less than ten days, two of which were respectively two and three days. The average incubation period by subcutaneous inoculation was sixteen days.

Intravenous inoculation. The period varied here from a minimum of two days to a maximum of twenty-four days. The cases had a period of incubation of fifteen days or more while seventeen showed a period of incubation of less than ten days; in six cases it was five days or less. The average period of incubation by the intravenous mode of inoculation was found to be ten days. The onset of the incubation period was calculated from the appearance of the first paroxysm and not from initial appearance of parasites in the blood.

A point which might be discussed is the amount of malarial blood to be inoculated. According to G. M. deRudolph, the volume of blood in itself bears no relation to the incubation period, but the number of parasites present in the blood is the important factor. In fact, the cases that received the smaller doses gave the higher incu-

bation periods as determined by the first appearance of parasites or by the first elevation in temperature. The patients that received the greatest number of parasites showed the longest incubation periods if the first rise in temperature was the factor regarded, but the shortest if the first appearance of parasites in the blood was the feature considered.

Our data show that the intravenous method of incubation shortens the incubation period to an average of five days. As the intravenous mode prevents loss of time, Nyssen advocates it, not only from this standpoint but because in agitated patients in precarious somatic conditions, this method of inoculation prevents the development of a too advanced debilitated state and assures the reduction of the period of hospitalization.

Another point of a practical interest is the question of natural or acquired immunity to malaria inoculation. In our series, a few cases showed an apparent total immunity so that even after three or four inoculations no paroxysms were obtained. A few other cases developed malaria after the third inoculation. A total of twenty-eight cases failed to develop malaria at the first inoculation. Of these, fifteen were not reinoculated whereas the remaining were reinoculated two or three additional times, the latter developing the infection after the second, third or fourth inoculation.

The partial or total failures in producing artificial malaria suggested to York and Macfie the existence of evidence that man exhibits some degree of immunity to malaria although his natural immunity is but slight, and in the vast majority of cases insufficient to prevent the development of the infection. On the other hand, there is evidence that the malaria parasites readily develop an immune body resistance which, however, does not confer a similar protection against the other species. This point is of practical interest, as in cases where inoculation with a special strain fails to produce results, an attempt could be made with other strains or even with other types of parasites. This point is also of interest in cases where reinoculation is advisable and where the reinoculation with the former strain fails to act. Following this line of thought attention has been called by Kirschner and v. Loon to the natural immunity which appeared to exist among the patients who were born in the tropics. These authors found that many of these patients failed to be infected while others showed signs of partial immunity, the fever developing after the second or third inoculation.

Another point which must be emphasized is the different clinical course between naturally acquired and artificially acquired malaria.

The observations of previous writers that artificially inoculated malaria is easily cured by comparatively short courses of treatment with quinine or salvarsan have been confirmed by our results. In thirty-eight cases of our series the malaria subsided spontaneously before any quinine was administered. On the other hand, only a very few cases of our series have had relapses of fever after the routine treatment had been completed and the patients sent back to their wards.

Various hypotheses have been advanced to explain the remarkable sensitiveness of the inoculated strain to quinine treatment. According to York and Macfie, the explanation of the success of the treatment in these induced infections is to be sought in the fact that we are concerned here with the early treatment of the disease or, in other words, with the treatment of primary infections and not, as in the war or as frequently in practice, with old-standing relapsed cases.

The influence of the malaria treatment on the blood cell count has been studied by several authors and among them are Bunker and Kirby and Pijper Skolveit and Russell. The latter found that a subcutaneous injection of from 0.5 to 10 c.c. of blood containing benign malaria parasites is quickly followed by a rise in the red cell count, amounting to somewhere between 10 and 30 per cent. This rise lasts several days, with minor daily variations, and is followed by a fall which constitutes the malaria anemia. As an injection of malaria blood cannot very well lengthen the life of the red blood corpuscles, the rise can only be explained as an increase in production of red blood cells. Normal blood has no such effect. An injection of malarial blood is a direct stimulus for the red bone marrow towards increased activity. Incidentally the authors state that the stimulus might be applied for therapeutic purposes (forms of anemia, especially chlorosis). The outbreak of fever can always be prevented by an injection of neosalvarsan as soon as the increase in red cells is well established. The whole process could then be repeated.

Skolweit, in the clinic of Prof. M. Nonne, has examined blood of paretics before and after the fever period. It is well known that lymphocytes play a material rôle in syphilis and the other infectious diseases. In the usual case of late syphilis Skolweit found in the cerebral type, lymphocytosis; in paresis, lymphopenia. He also found that at the end of the malaria attack there immediately occurred a strong lymphocytosis in the blood which continued for a long time, then gradually diminished; and that in parêtic patients with a remission the lymphocyte value was similar to that in cerebral syphilis. He, therefore, gained the impression that from intercur-

rent malarial infection the relation between virus and organism received an impetus that paretics reacted more like late syphilitics.

Abroad, the idea is prevalent that no hazard is to be feared from the propagation of the infection (Fleck, Gerstmann, Kirschbaum, Kaltenbach, Mühlens, v. Jauregg, etc.) and even experimental studies on this subject (Barzilai-Vivaldi and O. Kauders) have proved that artificial infection is not transmittable by means of the anopheles. However, the conclusions of these two authors have not been confirmed by Bravetta or by v. Engel. The latter has succeeded in transmitting the infection by anopheles bite when the passages have not been numerous and the circulating strain is rich in gametes. Bravetta has found that through different passages the fundamental type of the plasmodium vivax keeps itself constant and no differences can be noted even from the morphological point of view.

In this institution, the wards in which the patients are treated are well screened, and with this precaution no propagation of the infection has been reported.

Another important point in countries where malaria is not endemic is the transportation of the malarial organism for purpose of inoculation. Several methods have been suggested by Kirschbaum, Mühlens, O. Kauders and others. The methods suggested by the latter author is as follows:

(a) *Method of sodium citrate.* 5 c.c. of malaria blood are mixed in a sterile tube with 5 c.c. of 0.5 per cent sodium citrate solution. The tube is closed with a rubber cork and hermetically paraffined. The level of the fluid must not reach the base of the cork.

(b) *Method of agar blood.* 10–15 c.c. of malaria blood are defibrinated with small glass balls. The defibrinated blood is then transferred to a tube containing agar blood distributed on an inclined plane. Agar blood, which contains agar and blood in the proportion of three to one, must be freshly prepared and homogeneous. Closure of the tube must be done as in the previous method.

(c) *Method of gelatinization.* 2 c.c. of malaria blood are put in 10 c.c. of sterile gelatin—chemically pure. The gelatin must be dissolved at 30° centigrade in a water bath. The blood and gelatin must then be shaken for a few minutes, after which the gelatin is left for solidification. The infectious properties of the malaria blood so treated are preserved for at least forty-eight hours and at times up to three days. These tubes can be mailed.

The average number of chills that every treated patient should be allowed to have is twelve, according to the majority of authors. However, Mühlens and Kirschbaum have permitted their patients

to have seventeen and even twenty chills when no complications arise such as anemia or icterus. In our institution many patients have been permitted to have from twelve to eighteen chills and a few of them even more than this. We have as yet to find any hazard attached to this although Fleck suggests a limit of from eight to ten paroxysms.

In order to better understand the results of malaria treatment, we believe that we should outline the scheme that we have followed in the valuation of our results.

We have considered as remissions, cases exhibiting remissions even after six months' standing.

In Table No. 12 we have divided the cases according to the duration of the remission and the reader will be able to note the duration of remission in each group.

We have not included in our conception of remission the time factor. In other words, we have considered as remissions, not only those of long standing but those of short duration, six months and over.

In itself the time factor is irrelevant as far as remissions are concerned, but will be of value in the future when the duration of remissions are considered. In other words, we have taken into consideration patients from a cross-sectional point of view, but have placed a minimum limit of six months in cases that we have grouped as in remission. A future survey of these patients will inform us of the exact nature of their outcome.

We felt that it was necessary to include as remissions those of six months' duration, as well as those lasting from twelve to eighteen months, for the following reasons:

(1) The high percentage of these remissions as compared with those occurring spontaneously (average 10 per cent) and those following the usual course of treatment (3 per cent, according to Furman).

(2) The changes in the serology which follow malaria treatment. The serology has improved 36.32 per cent within twelve months and 52.8 per cent within twenty-four months.

(3) The pathological changes occurring in cases dying at various intervals following malaria inoculation.

In all cases examined microscopically (see paper of Dr. Freeman in the course of publication), those cases which exhibited partial or total remission during life showed a corresponding improvement in the pathology. Even after the brief period of four months, one of the cases examined revealed almost complete arrest of the patho-

logical process and in two cases lasting ten and seventeen months respectively not only was there complete disappearance of the inflammatory and degenerative lesions, but there was also considerable repair occurring in the cortex.

On the other hand, we feel that if we had to take into consideration the time factor and regard as remissions only those cases extending over two or three years, our conception would then lead to an error, as the intermediary cases with remissions extending from six to twelve months, and even up to eighteen months, would not be regarded as due to the malarial treatment. This would lead one to a false conclusion and it would impress upon one that malaria played no part in the resulting improvement or remissions; the remissions would then be considered as occurring during the normal course of general paresis. This cannot be true as the percentage of remissions following malaria treatment is very high as compared with the one occurring spontaneously, or following other forms of treatment.

Results of the Malaria Treatment

Of the 120 cases successfully inoculated with malaria, the general results obtained were as follows:

TABLE II

Total number of cases	Very good remissions	Partial remissions	Slight improvement	Unimproved	Deaths	
					Acute Malaria	Other causes
120	31	29	6	34	6	14

If we now add to the living cases those who died after the malaria treatment from other causes and group them as to their mental conditions at the time of their deaths, the ultimate results will be found to be as follows:

TABLE III

Total number of cases	Very good remissions	Partial remissions	Slight improvement	Unimproved	Deaths from acute malaria
120	31	33	10	40	6

Of the total number of successfully treated cases 25.73 per cent have shown very good remissions, 27.39 per cent a marked improvement (incomplete remissions), while 8.3 per cent exhibited slight improvement. The total degree of improvement following malaria treatment amounted to 61.45 per cent. If, however, we wish to exclude the ten cases showing slight improvement and confine our-

selves to the cases exhibiting a real appreciable improvement (good remissions and partial remissions), the total percentage of improvement is reduced to 53.12 per cent.

Very good remissions. In this class we have included all the cases that we have considered as socially recovered. We do not speak of recovery in general paresis as we have noticed that even in the most striking cases when a detailed and careful examination is performed, there can always be detected a slight degree of defective judgment or insight, and also emotional instability. The patients, however, can be considered as "socially recovered," meaning by this term a relative degree of mental and physical recovery which will enable the patient to function socially and even to return to his previous occupation or to some other form of labor which will assure him a living. The mental conditions of these patients, although slightly impaired, permits them to normally adapt themselves to their environment.

Partial remissions. Under partial remissions cases we grouped those who have shown an incomplete remission. Their physical and mental conditions are so benefited that these patients show a surprisingly good adaptation to the hospital environment. Many of these patients are allowed privileges such as ground parole and city parole, privileges that the patients use very satisfactorily. Although their mental condition is fairly good, defects can be detected in the emotional sphere and judgment as well as in memory for both past and recent events. So far as the course of improvement is concerned, some of these patients have been stationary since the onset of their improvement while others are still improving so that in the near future some very good remissions are hoped for. As regards the working capacity (Arbeitsfähigkeit of the German authors) these patients are capable of performing ward work or other routine hospital work even though their improvement is not sufficiently advanced to adapt to positions outside of the institution. However, if the relatives of some of them were willing to assume the responsibility of their maintenance, we feel that many of them could make a satisfactory adjustment outside. Undoubtedly some of them could even earn a partial living if conditions necessitated.

Very slight improvement. In this category we have placed those patients who have adjusted themselves fairly well to routine hospital life. Although of no value in the routine work of the wards, these patients have become tidy, neat in dress and habits and as a rule coöperative in the routine examinations. Some of them have

exhibited no further changes since the time of the treatment while a few others have shown a slight tendency towards a more pronounced improvement.

Unimproved. Among the unimproved cases we have classed those who have remained stationary for a long period of time following the malaria treatment. Whether this prolonged stationary period is to be regarded as the result of the treatment it is difficult to say although some of the patients actually show a prolongation of the disease which is far longer than the usual duration.

As a matter of fact we have to consider that following the malaria treatment many of the unimproved cases show at least a subsidence of the stormy phase, becoming more quiet, cleaner, less careless and, as a rule, not bedridden as is usually expected with ordinary cases—and, as a whole, they are less burdensome to the institution.

Deaths. The total number of deaths was twenty. Of these only six died during the acute stage of malaria, and the percentage of death risks with this new form of treatment is then only 4.9 per cent. The figures of our results are not very far from those of Reese (2.9 per cent) and Fleck (3.6 per cent). The other fourteen cases died at different intervals after the malaria treatment. One of them died two months afterwards (no autopsy performed), two after five months (no autopsy), two after six months (bronchopneumonia), one after eleven months (cardiovascular disease), two after twelve months, one after seventeen months (ruptured aneurysm), one after eighteen months (spontaneous rupture of the bladder), two twenty-five months after (bronchopneumonia), one after 37 months (no autopsy) and one thirty-eight months after (bronchopneumonia).

* * * * * * *

As the type of paresis seems to exert a certain influence on the result of the malaria treatment, we have in the following tables divided all the treated cases in relation to the type of paresis and to the result of the treatment.

TABLE IV

Cases showing very good remissions

Total number of cases	Demented type	Depressed	Manic	Expansive paranoid	Taboparesis	Juvenile	Schizoid	Stationary
31	3	8	8	11	—	—	—	—

TABLE V

Cases showing partial remissions

Total number of cases	Demented type	Depressed	Manic	Expansive paranoid	Taboparesis	Juvenile	Schizoid	Stationary
33	7	1	1	13	2	1	1	1

TABLE VI

Cases showing slight improvement

Total number of cases	Demented type	Depressed	Manic	Expansive paranoid	Taboparesis	Juvenile	Schizoid	Stationary
10	3	—	1	4	1	—	1	—

TABLE VII

Cases stationary or unimproved

Total number of cases	Demented	Depressed	Agitated	Expansive paranoid	Taboparesis	Juvenile	Schizoid	Stationary
40	21	3	3	6	—	3	3	1

By studying these tables, we can easily see how the different types of paresis react to this new form of therapy. Leaving out of consideration acute cases of malarial deaths, only three cases of the demented type of paresis of the thirty-four showed very good remissions, while seven were improved, three slightly improved, and twenty-one remained stationary. Undoubtedly the highest percentage of the unimproved cases is in the demented type, which represents 52.5 per cent of the unimproved cases and 55.44 per cent of the whole group of demented cases. The greatest number of very good remissions is in the expansive-paranoid type, as out of a total of thirty-one cases of good remissions eleven were of this paranoid type. Considering now the total number of the expansive-paranoid cases, we see that eleven have shown very good remissions (29.04 per cent), thirteen partial remissions (34.32 per cent), and four (9.56 per cent) slight improvement. Of the sixty-four cases showing very good or partial remissions, twenty-four, or 37.44 per cent, were in the excited-paranoid group.

Next to the expansive-paranoid type, the depressed type shows the greatest number of very good remissions. In fact, 25.6 per cent of the very good remissions were of this type. The same percentage was shown by the manic type, which is also represented by eight cases of the very good remission series.

But if we consider the percentage of very good remissions of the

depressed type in comparison with the entire group of this type, we soon find that the depressed cases are those which offer the highest percentage of very good remissions. In fact, of the twelve cases which constitute the entire group, eight, or 66 per cent, have shown very good remissions. Of the manic cases, 41.6 per cent of the group have shown very good remissions, 36.4 per cent partial remissions, 5.2 per cent slight improvement, while 15.6 per cent are unimproved.

The schizoid type, as well as the juvenile type, offers marked resistance to improvement. Of the four cases of the juvenile type, only one has shown any improvement, while three (75 per cent of the group) has shown no improvement. Of the five schizoid cases, two have shown improvement, while three (60 per cent) have been stationary.

TABLE VIII

Results of treatment in the different types of paresis
(Percentage of results in each type)

Result of treatment	Depressed type %	Manic type %	Expansive type %	Demented type %	Taboparesis %	Juvenile type %	Schizoid type %	Stationary type %
Very good remissions	66	41.6	29.04	7.92				
Partial remissions	8.3	36.4	34.32	28.68	66.6	25	20	50
Slight improvement		5.2	10.56	7.92			20	
Unimproved	25.9	15.6	15.84	55.44	33.3	75	60	50

The figures of Table 8 show that the type of paresis which offers the highest probability of success for the malaria treatment, as shown by the combined number of good remissions and partial remissions cases, is the manic type of paresis (78 per cent). This is followed by the depressed type (71 per cent) and then by the expansive-paranoid type (63.36 per cent). The dementing type, the juvenile, and the schizoid are next in sequence, these showing marked resistance to this special form of treatment, as the percentage of the unimproved cases is respectively 55.4, 75 and 60 per cent.

Our data do not correspond entirely with those of other authors. Gerstmann, for instance, found that the highest percentage of remissions is found in the simple demented type and in the cases of taboparesis. Conversely, Kirschbaum states that the demented type offers the smallest percentage of the remissions, whereas the manics are those who contribute largely to the good remissions. Pilcz states the best results are obtained in cases of the maniacal form, and in

the simple demented type, the hypochondriacal, presenile, and catatonic forms of the disease offering a less favorable prognosis. Herzig and Jossmann and Steenaërts also claim that the manic patients are the ones most influenced by the treatment, while the simple dementing type, according to the two latter authors, show the most unfavorable results. The data given by Fleck are as follows: Remissions: 18.8 per cent of the dementing type, 62.5 per cent of the expansive type. Unimproved: 33.3 per cent of the expansive type, 59.3 per cent of the dementing type. According to Bunker and Kirby, 12 per cent of cases of the simple demented type achieved full remissions, whereas 55 per cent of the expansive type and 67 per cent of the manic type attained therapeutic results.

* * * * * * *

As the age factor has been considered by some authors as being of importance in the prognosis of the treatment, we have in the following table divided all the patients successfully inoculated according to their age at the time of the treatment:

TABLE IX

Division of the malaria treated cases according to the age of the patient

Result of treatment	AGE									
	15–20	21–25	26–30	31–35	36–40	41–45	46–50	51–55	56–60	66–70
Very good remissions		1	9	7	5	5	2	1		1
Partial remissions	1		5	9	7	7	4			
Slight improvement			2	5	2		1			
Unimproved	2	2	5	5	12	6	5	3		

Although the results are not very striking, it can, however, be seen from this table that the greatest number of very good remissions are found between 26 and 40 years. In fact, twenty-one of the thirty-one cases are between these two ages, sixteen (more than 50 per cent) being between 26 and 35. The same can be said of the partial remission cases, as twenty-one of the thirty-three improved cases are from 26 to 40 years, fourteen (42.42 per cent) being between 26 and 35 years. If we consider now the proportion of the unimproved cases which are between 26 and 40 years, we find this proportion to be lower than for the cases in the first two categories: 55 per cent as compared with 69.69 per cent of the partial remission and 67.2 per cent of the very good remissions. On the other hand, twenty-six out of the forty of the unimproved series are

between 36 and 55 years, viz., 65 per cent as compared with 41.6 per cent of the very good remissions and 54.54 per cent of the partial remissions cases.

On the whole, it would seem that the older the patient is the less probability there is of benefit from the malaria treatment. Impressed by these facts, some authors, as Jansen and Hutter, suggest that patients over 55 years of age should not be treated.

Another point of interest is the result of the treatment as compared with the duration of the disease before the malaria treatment. Some foreign authors are inclined to attribute considerable importance to the time factor that has elapsed between the onset of the disease and the date of malaria inoculation. Among the many, Jossmann and Steenaerts, Gerstmann, Kirschbaum, Fleck, Lilly, and Bering have especially emphasized this point. According to Lilly, it is probable that cases exhibiting a long history of mental symptoms are not so likely to improve as those whose disease is of more recent origin, although a patient with a short history has not necessarily a hopeful prognosis. The degree of mental abnormality at the time of treatment is no criterion of what is likely to happen after the malarial fever.

The accompanying table shows the number of cases in each category divided according to duration of the disease before the treatment. In a few cases it has been impossible to establish the exact time of the onset of the disease. We have considered as the onset the appearance of the first abnormal signs in the mental activity of the patient, as reported by the relatives, the date of admission to this institution being an unreliable factor.

TABLE X

Result of treatment as compared with the duration of the disease before treatment

	Duration of disease before the malaria treatment					
Result of treatment	Within first 6 months	Within 12 months	Within 18 months	Within 24 months	Within 36 months	More than 3 years
Very good remissions	5	4	5	8	4	2
Partial remissions	4	7	3	3	5	8
Slight improvement	0	4	1	2	0	3
Unimproved	9	1	2	10	2	16

Table X shows that while cases in the very good remission class treated within the first eighteen months following the onset of the disease represent 47.6 per cent of the entire series, the partial remissions series represent 46.2 per cent, while the unimproved represent only 30 per cent of the cases.

On the other hand (and here the results are more striking), while the cases successfully treated three years or more after the onset of the disease represent 15 per cent of the very good and partial remissions cases, those unsuccessfully treated after three years from the onset of the disease represent 40 per cent of the entire series. If we consider now all the cases of two or more than two years duration, we find that these cases represent 40 per cent of the very good remissions and 70 per cent of the unimproved series. From this table we may conclude that the old standing cases (over two years) offer less probability of successful treatment with the malaria inoculation.

We cannot quite agree with the conclusions of Nyirö-Gyula and Sandor Stief that none of the incipient cases treated within the first six months fail to show remission.

Comparing now the result of the treatment with the time elapsing from the date of malaria inoculation, we find the following data:

TABLE XI

Time of inoculation	Result of treatment			
	Very good remissions	Partial remissions	Slight improvement	Unimproved
More than 3 years before	13	13	2	15
18–24 months before....	6	8	2	13
12–18 months before....	2	2	1	5
6–12 months before....	9	9	5	7

* * * * * * *

How long do remissions persist? This point is of real practical interest inasmuch as it might be argued that remissions following malaria therapy are of short duration and that relapses might easily occur, as in the cases of spontaneous remissions.

TABLE XII

Duration of remissions (very good and partial remissions cases)

6–12 months	12–18 months	19–24 months	25–36 months	More than 36 months
18	4	14	2	24

Table XII shows that the duration of remissions is surprisingly long when we consider that twenty-four of the cases show a remission lasting now more than three years, while forty-three show a remission of almost two years or longer.

What is the average percentage of spontaneous remissions in general paresis? In the Hamburg clinic, over a period of eight years of admissions, the average as reported by Kirschbaum was 11 per cent. Tophoff found that the occurrence of spontaneous remissions in general paresis was only 4.8 per cent with the very good remissions and 14.9 per cent with partial remissions. W. Raynor, covering a period from July, 1911, to June, 1918, during which 1,004 paretics entered the Manhattan State Hospital, found a total number of eighty-five patients who were improved, thirty-three of which had good remissions. The author concludes that spontaneous remissions in patients with untreated cases of G.P. occur, but are not frequent, and that at least in more than one-half of the cases they are not permanent.

Furman, who has studied the occurrence of remissions in the usual treated cases of G.P., has found that in 503 patients only twenty-one showed spontaneous remissions, viz., almost 4.2 per cent.

The percentage of spontaneous remissions in G.P. as given by different authors are: Acker (1888), 14.3 per cent; Behr (1900), 4.08 per cent; Hoppe (1901), 16.8 per cent; Gaupp (1903), 10 per cent; Pilcz (1908), 21 per cent; Joachim (1912), 4 per cent; Dübel (1916), 13.5 per cent; Kirschbaum (1923), 11 per cent. Comparing these percentages with those of our results, we find that the total percentage improvement in our cases amounts to 61.45 per cent, 53.12 per cent of which show real appreciable remission.

If we now consider the duration of the remissions in our malaria treated cases with the duration of spontaneous remissions as given by Raynor, we see that the author reports nineteen deaths in thirty-three cases, showing very good remissions. Of these nineteen, thirteen died within the first year of remission, one after three years, one after four, one after five, one after seven, and one after eight years. In our series of thirty-one cases of very good remissions, none died, seventeen of them show a remission of more than two years, and fourteen a remission of more than three years. Of the thirty-three partial remissions cases, only four have died, one thirteen months after the treatment, one seventeen months after from a ruptured aneurysm, one twelve months after from sepsis following a prostatic abscess, and one twenty-nine months later from paresis and bronchopneumonia.

* * * * * * *

Has the treatment any influence at all on the unimproved cases? Even in these cases the beneficial influence of the malaria treatment can be noticed as it seems to us that the treatment, as a rule, prolongs the life of the patients. In fact, if we take into consideration only the unimproved cases who have received malaria treatment in 1923, more than three years ago, we find that of the fifteen patients only four have died. Of the remaining, the duration of the disease, including both the periods previous and following the malaria treatment, is reported in the accompanying table.

TABLE XIII

Total duration of the disease in the unimproved cases.

Duration of the disease before the malaria treatment	Duration of the disease following the treatment	Total duration of the disease
6 months	41 months	47 months
3 "	42 "	45 "
3 "	45 "	48 "
60 "	40 "	100 "
48 "	41 "	89 "
5 "	39 "	44 "
48 "	40 "	88 "
24 "	38 "	62 "
48 "	40 "	88 "
1 "	40 "	41 "
60 "	40 "	100 "

It may be seen from Table XIII that the duration of the disease is increased, the patient living longer than 2–3 years, this being the average period of life for untreated cases of G.P. It must be added, however, that these patients although unimproved from the mental point of view, have on many occasions exhibited certain degrees of physical improvement or have been stationary.

Is there any parallelism or relationship between the result of the treatment from the clinical point of view and the number of paroxysms experienced by the patient? Table XIV shows the percentage of improvement or unimprovement as compared with the average number of chills.

TABLE XIV

Relationship between clinical results and number of paroxysms

	Number of chills							
Result of treatment	1–6		7–12		13–18		More than 18	
Very good remissions	3	9.6%	11	35.2%	15	51.2%	1	3.2%
Partial remissions	3	9.09%	8	24.24%	19	57.5%	3	9.09%
Slight improvement	2	22.2%	2	22.2%	5	55.5%		
Unimproved	8	20%	11	27.5%	19	47.5%	1	2.5%

From this table, the only striking point is the large percentage of unimproved cases who have had from 1 to 6 chills. While the percentage of the very good remissions and improved cases who have had from 1 to 6 chills are respectively 9.6 per cent and 9.09 per cent, the percentage of the unimproved cases who have had only a few chills is higher, viz., 20 per cent. The percentage of unimproved cases who have had from 13 to 18 chills is slightly less than the number of very good remissions, but is evidently lower than the partial remissions cases who had the same number of chills.

Comparing now the clinical result of the treatment with the highest temperature reached during the paroxysms, the following results were found.

TABLE XV

Relationship between the clinical results and the highest temperature

Result of treatment	Highest temperature 103		104		105		106		107	
Very good remissions	4	13.6%	4	13.6%	8	27.2%	9	30.6%	4	13.6%
Partial remissions	1	3.1%	3	9.3%	9	27.9%	15	46.5%	4	12.4%
Slightly improved	1	12.5%	4	50%	3	37.5%				
Unimproved	2	5.2%	5	13%	18	46.48%	12	31.2%	1	2.6%

The point revealed in this table is the high percentage of cases showing good or partial remissions, those having highest temperature showing greater improvement. In fact, the unimproved cases who have had a rise in temperature of 106° and 107° were only 33.8 per cent of the unimproved series. The good and partial remissions cases who had the same rise reached respectively 44.2 per cent and 58.9 per cent of the total cases of the series.

Unfortunately, we have no complete record of the duration of fever in terms of number of hours during which a given height of temperature was maintained so that we cannot add to the contributions of Kirby and Bunker, who have taken into consideration the relation of height and duration of fever to the clinical outcomes of malaria treatment.

Serological Changes Following the Malaria Treatment

In a previous paper we discussed in full detail the serological changes following the malaria treatment in general paresis.

We studied ninety-three cases who had several spinal punctures following the malaria inoculation and divided them according to the

time elapsing from the malaria treatment. The following table taken from our previous work shows the serological changes as they occurred in periods varying from six months to three years following the malaria treatment.

TABLE XVI

Serological changes following malaria treatment

Number of cases	Time intervals	Blood	Cerebrospinal fluid			
		Wassermann	Wassermann	Cells	Globulin	Colloidal Gold
25	Within 6 months					
	Unchanged	11	20	8	8	20
	Improved	7	4	12	14	5
	Negative	7	1	5	3	0
14	Within 12 months					
	Unchanged	3	5	7	4	7
	Improved	4	6	3	8	7
	Negative	7	3	4	2	0
20	Within 18 months					
	Unchanged	3	6	5	8	8
	Improved	6	7	10	10	12
	Negative	11	7	5	2	0
11	Within 24 months					
	Unchanged	0	0	0	5	1
	Improved	1	5	6	5	10
	Negative	10	6	5	1	0
23	Within 36 months					
	Unchanged	2	2	1	4	3
	Improved	1	5	6	5	10
	Negative	20	16	12	7	2

In order to establish a percentage of the improvement in relation to the time elapsing from the malaria treatment to the last spinal puncture performed, we have not included cases of less than a month's duration, but have included the cases of eighteen months' standing in the series of twelve and twenty-four months. The results so obtained are the following:

Within 6 months: 20 cases { Serologically improved, 3: 15%
Serologically unchanged, 17: 85%

Within 12 months: 22 cases { Serologically improved, 8: 36.32%
Serologically unchanged, 14: 63.68%

Within 24 months: 15 cases { Serologically improved, 8: 52.8%
Serologically unchanged, 7: 47.2%

Within 36 months: 29 cases { Serologically improved, 25: 86%
Serologically unchanged, 4: 14%

These figures show that the percentage of serological improvement increases grossly from a minimum of 15 per cent within the first six months to a maximum of 86 per cent after a period of three years.

The period that has elapsed from the date of the malaria inoculation to the time of the last spinal puncture is then very important and certainly explains the discrepancies of our results compared with those reported by other authors who have neglected the time factor.

Analyzing the result of our findings in the cases of thirty-six months' duration, we see the astonishing serological findings in both the blood and the cerebrospinal fluid. In fact, twenty of the twenty-three cases reported in Table XVI show negative blood Wassermann and sixteen negative spinal fluid Wassermann. The cell count became normal in twelve of the twenty-three cases and the globulin negative in three of them. The colloidal gold improved in twenty cases, being negative in two and changing from a paretic type into a syphilitic type in the others.

More accurate details will be found in our previous paper. However, it seems useful to report some of the conclusions we arrived at in our investigations:

(a) The first serological element which improves following the malaria treatment is the pleocytosis, which is reduced within a few days following the treatment. Of the cases of more than twenty-four months' standing 95.7 per cent show great improvement, while 50 per cent show a complete reversal to the normal number of cells.

(b) The globulin content, although gradually improving, shows less pronounced changes than the cell content.

(c) The Wassermann reaction of the cerebrospinal fluid is third in order of improvement. The rate of improvement within the first six months is 20 per cent, increasing to 90 per cent within thirty-six months; 68 per cent of the cases of thirty-six months' standing show a complete negative reaction.

(d) The colloidal gold reaction is the element most resistive to the treatment, as within twelve months only twelve of the thirty-nine cases show signs of improvement. The improvement then increases gradually although the reversal to an absolute normal curve is rare.

(e) The blood Wassermann rapidly improves and within the first six months 28 per cent of the cases already show a negative reaction. After thirty-six months the percentage reaches 86.

(f) No parallelism was found between the serological improvement and the maximum of temperature, while parallelism is evident between the number of chills and the percentage of improved cases.

Comparing, in a series of cases, the clinical with the serological improvement, we found that in the early stages there is absolutely no parallelism between the clinical and the serological improvement. But as time elapses, a higher correlation may be noticed, and within

twenty-four months following the malaria treatment the percentage of the improved cases, both from the serological and clinical point of view, is practically the same. Within thirty-six months the parallelism is still more striking, as all the clinically improved cases have also improved serologically. But, conversely, not all the serologically improved cases show clinical improvement. A comparative percentage of the clinical and serological improvement as reported in our paper on the serology shows that the clinical improvement is 61.2 per cent, as compared with 36.32 per cent of the serological improvement. The percentage is highly modified in the subsequent period, as within thirty-six months the cases clinically improved represent 65.2 per cent, as compared with 85 per cent of the serologically improved.

There is then no absolute parallelism existing between the clinical and the serological improvement, even in the later period. But while in the earlier stages the lack of parallelism is absolute, in the later period a partial parallelism exists in the sense that all our improved cases from the clinical point of view show a concomitant serological improvement.

From the clinical point of view, we will now consider some changes in the mental reactions following malaria treatment. Gerstmann has called attention to this special subject in a careful study of the acute transitory or permanent changes following this new method of treatment.

Some of the reactions immediately follow the onset of the paroxysms, assuming the type of the "amentia" which occasionally accompanies infectious diseases. At other times the reaction is that of a simple delirium accompanied by hallucinations, and finally at others the mental reaction is that of a precox type with hallucinations and paranoid ideas. These mental reactions may last a long time, and in these cases the patients even show typical catatonic and manneristic symptoms.

We have no data concerning the mental reactions in the acute stage of malaria, but in our series of 126 cases we have found four patients who, following the malaria infection, have developed typical precox reactions with auditory hallucinations, paranoid ideas, mannerisms, and a more or less pronounced negativism. The clinical picture presented by these patients would certainly cause an error of diagnosis if the previous history and serology were unknown. A detailed study of these cases will form the subject of a separate note. At present we wish only to call attention to these schizoid reactions which may constitute a clue for research on the relationship between syphilis and a few cases of dementia precox.

Neurological Changes Following the Malaria Treatment

Not all the treated patients have been considered from this point of view, as in their records not all the patients have satisfactory notes regarding their neurological conditions before the malaria treatment. Our data comprises only those cases which have been carefully examined from the neurological point of view preceding and following treatment.

Pupils: Table XVII, on page 249, shows the modifications occurring in the pupillary reactions divided as to the results obtained by treatment.

Of the thirteen cases of the very good remissions, showing sluggish reaction to light before the malaria treatment, only one case has manifested improvement, the reaction to light in this case becoming normal. On the other hand, another case with sluggish reaction lost all reaction, the pupils being immobile following the treatment. The reaction to accommodation seems to be more susceptible to influence, as out of the ten sluggish reactions four improved, acquiring again a normal reaction, while only one became aggravated.

No appreciable modification in the regularity of the pupils followed the treatment, and the same held true for the equality. There is rather a tendency to aggravation, as in two cases with equal pupils an aniscoria was recently noticed.

In the partial remission group no record of improvement is reported as regards the reaction to light and accommodation, nor is there for the regularity. In this series, also, one of the cases with equal pupils showed aniscoria following the malaria treatment.

In the unimproved series, the reaction to light became worse in two cases and the reaction to accommodation worse in one case. Two of the cases even lost their previous equality.

Deep Reflexes of the Upper Extremities

(a) *Radial.* In the very good remission series, two cases showing hyperactive radial reflex and one showing sluggish radial reflex reversed to normal following the treatment, while of the partial remission series only one of the hyperactive group reversed to normal and another became sluggish. Of the unimproved series, three of the normal cases became sluggish during the further course of the disease.

(b) *Cubital.* In the very good remission series, two cases have shown improvement reverting to normal from a previous hyperactive

TABLE XVII

	Reaction to light						To accommodation						Regularity				Equality			
	Before			After			Before			After			Before		After		Before		After	
	R	S	A	R	S	A	R	S	A	R	S	A	R	IR	R	IR	E	UE	E	UE
Very good remissions	5	13	2	6	11	3	6	10	2	10	5	3	4	8	4	8	9	4	7	6
Partial remissions	4	7	0	4	7	0	9	6	0	9	6	0	2	5	2	5	10	4	9	5
Stationary	1	6	7	0	5	9	8	2	3	8	1	4	4	8	4	8	5	8	3	10

R: Reacts
S: Sluggish
A: Absent
IR: Irregular
R: Regular
E: Equal
UE: Unequal

condition. Conversely, however, two of the hyperactive became sluggish. In the partial remission cases one case reverted to normal, while another changed from hyperactive into sluggish condition. In the unimproved series, two cases reverted from a normal reaction to a sluggish one.

(c) *Bicipital.* The bicipital reflex improved in one case of the very good remission series, while it became worse in the partial remission series, changing from a normal condition into one of sluggishness. The same changes occurred in two of the cases of the unimproved series.

(d) *Tricipital.* Improvement has been noticed in one case of the very good remission series, while one case of the same series changed from a condition of hyperactivity into one of sluggishness. In the partial remission series, three cases changed from hyperactive into a sluggish condition, while one case improved, the reflex being sluggish, whereas before the treatment it was absent. In the unimproved series two cases changed from a normal condition into a pathological one (hyperactive and sluggish).

In terms of percentage, the changes occurring in these reflexes following the malaria treatment may be rated in this way: *Unimproved series:* Aggravation of the previous conditions: Radial reflex in 75 per cent of the normal cases, cubital reflex in 50 per cent, bicipital and tricipital, respectively, 66 per cent of the cases. *Very good and partial remission cases:* Improvement of the radial reflex: 18.75 per cent for the good remission series and 7.6 per cent for the partial remission series. Improvement of the cubital reflex was respectively 12.6 per cent and 7.6 per cent for each of the good and partial remission series. Improvement of the bicipital reflex: 5.8 per cent for the very good remission series. Improvement of the tricipital reflex: respectively, 5.8 per cent and 0 per cent. Conversely, there is an aggravation of the bicipital reflex in 33 per cent of the partial remission cases.

These figures show that while there is an evident, although slight, tendency toward improvement of these neurological conditions in the cases of the very good remissions as well as of the partial remission series, a comparatively high percentage of aggravation is seen in the series of the unimproved cases.

Deep Reflexes of the Lower Extremities

(a) *Knee jerks.* In the very good remission series two of the previous normal cases showed sluggish reaction, while one case lost

the reflexes which were present previous to the malaria treatment. In the partial remission series, one case lost the previously normal reaction, while two others of the hyperactive group became respectively sluggish and absent. No changes were noticed in the unimproved series.

(b) *Ankle jerks.* Three of the normal cases belonging to the very good remission series and one belonging to the partial remission cases lost their previously normal reflexes. In the unimproved series three cases changed from a normal into a sluggish reflex.

In terms of percentage, we see that 75 per cent of the normal cases of the very good remission series show an aggravation of the condition of the knee jerks and 50 per cent an aggravation of the ankle jerks. Twenty per cent of the normal cases of the partial remission series show the same aggravation of the knee jerk reflexes and 42.6 per cent of the ankle jerk. Conversely, no aggravation has been noticed in the unimproved series in regard to the knee jerk, while 50 per cent of this same series show an aggravation of the ankle jerks.

The percentage of aggravation of the ankle jerk is then slightly higher in the unimproved series than in the partial remission cases.

Superficial Reflexes

Abdominals. In the very good remission series these reflexes in three of the normal cases became sluggish. In the partial remission series, two of the normal cases became sluggish in their reaction, while in one the previously normal reflexes disappeared. In the unimproved series two cases changed from normal to sluggish in their reactions.

Cremasteric reflexes. Two of the hyperactive cases belonging to the very good remission series reverted to a normal condition, while three of the partial remission series changed from a normal condition into a condition of sluggishness. Of the unimproved series four cases changed from normal to sluggish.

Plantar. The only change in regard to this reflex was found in the unimproved series, in one case of which the normal response to plantar stimulation was lost.

In terms of percentage, 42.6 per cent of the normal cases of the very good remissions, as well as of the partial remission series, have shown aggravation of the abdominal reflexes, while 33 per cent of the unimproved series have shown the same changes.

Of the cremasteric reflexes, 27 per cent of the very good remission series have shown an improvement, while 33 per cent of the

partial remission cases and 66.6 per cent of the unimproved cases showed an aggravation of the condition.

Of the plantar reflex, 10 per cent of the unimproved series have shown a condition of aggravation.

Babinski sign. In the very good remission series, two cases showed Babinski sign previous to the malaria treatment, but in one the pathological reflex was afterwards lost. The Babinski sign also disappeared in the four cases of the partial remission series, as well as in the only one of the unimproved series in which the reflex was present previous to the treatment.

Coördination. This test shows a marked improvement in the very good remission series, as all the six impaired cases have shown a reversal to the normal condition (100 per cent). In the partial remission series the three impaired cases have shown the same changes (100 per cent), while in the unimproved series one of the three cases became aggravated (33 per cent).

Ataxia. There was improvement in both cases of the very good and partial remissions (100 per cent).

Tremors. The facial tremor, as well as the tremor of the extremities, have been markedly influenced by the malaria treatment, as seven of the fifteen cases (46.2 per cent) of the very good remission series, three of the thirteen cases (22.8 per cent) of the partial remission series, and four of the unimproved series (36.04 per cent) have shown a disappearance of the tremors which were present prior to the malaria treatment.

Speech defect. The typical speech defect of general paresis was also evidently influenced, as this trouble has disappeared in nineteen of the very good remission series (77.9 per cent) and in eleven of the partial remission cases (47.5 per cent).

Seizures. The seizures have disappeared in both cases of the very good remission series, while in three out of the four cases of the partial remission series no marked influence on the seizures has been noticed.

Focal lesions (Cranial nerve involvement—pyramidal or extrapyramidal signs). The focal lesions have been beneficially influenced in only one of the two cases belonging to the very good remission series.

From the results of these data, there can be seen that no definite conclusions can be drawn, as the improvement in the neurological conditions are noticed in the unimproved series as well as in the

improved cases and in those with very good remissions. On the other hand, an aggravation in some of the neurological conditions can be also seen in the partial and even in the very good remission cases, while on the whole there is a tendency toward improvement following the malaria treatment.

Among the neurological signs showing the most marked improvement in the course of the malaria treatment are the speech defect, the coördination test, and the tremors. The convulsions are apparently uninfluenced, our data disagreeing with those of certain German authors.

Weight. From a general point of view we have noticed in many of our patients a gain in weight which sometimes has been considerable. We do not agree with G. M. de Rudolph, who found that in the majority of patients the weight remained stationary. Our data agree much more with those of Bunker, who found a gain in weight in 80 per cent of his cases above the pretreatment level. Unfortunately, we cannot discuss the weight factor as a prognostic indicator as our data bearing on this topic are not sufficiently complete.

* * * * * * *

How does malaria act? This question has been debated at length, but no satisfactory answer has as yet been furnished. Many authors claim the rise in temperature is the real factor responsible for the beneficial reactions. The organism of the patient responds to the rise of temperature by humoral diffuse changes which permit a more successful fight against the disease. The exact mode of action of the high temperature is, however, unknown. Weichbrodt and Jahnel, on the basis of their experiments, have found that by placing a rabbit infected with syphilis in an oven at a temperature of from 107.6° to 110° F. (42–43 C.) for an hour, and repeating this not less than three times, a complete disappearance and death of spirochetes present in the scrotal chancre of the animal resulted. It is known, on the other hand, that the spirochete fails to grow at a temperature from 104° to 106° F. (40 to 41 C.).

In the course of our investigations, we have found that from the serological standpoint a parallelism exists between the number of chills and the improvement. Thus we are inclined to believe that the temperature presumably plays an important rôle in determining the disappearance of the spirochetes, as well as in influencing the inflammatory changes.

Some other authors believe that a sort of antagonism exists between the malaria parasite and the spirochete of the G.P. But whether or not the antagonism is directly or indirectly produced by antibodies which are injurious to the spirochete is still a debatable question. It is a fact, however, that in malarial regions the percentage of syphilitics becoming paretics is very low. Bercovitz, for instance, reports that in Hainan (China) 90 per cent of the population is infected with malaria, syphilis is practically universal, and yet in eight years he has not seen a case of G.P. and only two or three of tabes. De Bellard (Gazette med. de Caracas, 1925), who sees on an average of one thousand patients a month, 50 per cent of whom have syphilis, has as yet never encountered a case of G.P.

In Sardinia (Italy), which is still a markedly malaria infested region, the number of paretics seen at the clinic of the Nervous and Mental Diseases of the University of Sassari or in the local insane asylum is really surprisingly low as compared with those found in other regions, and the type of paresis appears to be quite different from the classic expansive or manic type, the patients being usually of the simple demented type.

The idea of an immunity reaction due to malaria has been advanced by Plaut, Kirschbaum, and recently accepted by others, among them Wizel and Prussak. Following the same line of thought, Weichbrodt infected a paretic patient simultaneously with malaria and relapsing fever. This latter infection did not become manifest until after the malaria had been cured with quinine. The author thinks then that a similar depressive immunity may be the explanation of the action of the malaria treatment on general paresis.

Other authors believe that the favorable results obtained by the malaria treatment are due to the leucocytosis which follows the infection. However, Weichbrodt and Jahnel disregard this view, as they report that in some cases of typhoid fever, for instance, which produces a leucopenia instead of a leucocytosis, there has at times been exerted a favorable influence on the course of the general paralysis.

Besides the already mentioned factors, Bunker and Kirby are unable to divest themselves of the impression that a satisfactory outcome in the treatment of general paralysis may depend not only on the absence of irreparable and irrevocable anatomic changes, but also on the capacity of the organism to react to the stimulation which the malaria treatment as apparently a form of foreign protein therapy is potentially capable of furnishing: the absence of such response

rendering impossible in certain cases this mental improvement, which the organic damages alone might have not precluded.

BIBLIOGRAPHY

E. Aguglia e E. d'Abundo. Tentativi di terapia con innesti di malaria terzana nella p. p e nelle sindromi parkinsoniane. Rivista Italiana di Neuropat. Psichiatria e Elettroter, Vol. 16, 1923, p. 173.

E. Artwinski. Über die Behandlung der progressivon Paralyse mit Malaria. Polska Gaseta lekarska, Jg. 3, No. 5, 1924, p. 800.

V. Askgaard. Vorlaufige Resultate ein jähriger Malariabehandlung von Paralytikern. Ugeskrift F. laeger, Jg. 86, No. 15, 1924, p. 307.

G Barzilai-Vivaldi und O. Kauders. Die Impf. Malaria experimentell durch Anophelen nicht übertragbar. Wiener Klinische Wochenschrift, No. 41, 1924, p. 1055.

Bering. Discussion on the paper of M. Nonne: Die Behandlung der Spat und Metalues. Allgemeine Zeitschrift für Psychiatrie, Bd. 81, 1925, p. 141.

W. Böhnig. Über die Fieberbehandlung der progressiven Paralyse durch Milchinjection. Archiv. für Psychiatrie, Bd. 71, 1924, p. 701.

G. Bosch and A. No. Malaria Treatment of General Paresis. Semana Medica, 1926, p. 25.

H. Bondy. Malaria Treatment of Paresis. Casopis lekar ceskych, Prague, Nov. 1924, p. 1699.

Bratz. Discussion of the Paper of Jossmann and Steenarts. Zentralblatt für die gesamte Neurol. und Psych., Bd. XXXV, 1924, p. 443.

G. Bravetta. Reperti emoparassitari e malariologici nella cura della paralisi progressiva. Note e Rivista di psichiatria, Vol. XIV, 1926.

H. Bunker and G. Kirby. Treatment of General Paralysis and Malaria. Journal of the American Med. Assoc., Vol. 84, Feb. 1925.

Id., Id. The Height and Duration of Fever in Relation to the Clinical Outcome in the Treatment of General Paresis with Malaria. Medical Journal and Record, New York, April, 1925, p. 413.

Id., Id. The Treatment of General Paralysis by Inoculation with Malaria. Archives of Neurology and Psychiatry, Vol. 16, 1926, p. 182.

Id., Id. Presentation of Paresis Exhibiting Some Results Obtained by Treatment with Tryparsamide and Treatment with Malaria. Archives of Neurology and Psychiatry, Vol. 12, 1924, p. 116.

H. Bunker. The Significance of Gain in Weight in the Malaria Treatment of General Paralysis. Archives of Neurol. and Psychiatry, Vol. 16, 1926, p. 329.

H. Claude et R. Targowla. Le traitement de la paralysie generale. L'Encéphale, 20 annoe, No. 7, 1925.

B. Dattner and O. Kauders. Klinische und experimentelle Stüdien zur therapeutischen Impf. Malaria. Franz Deuticke, 1924, Leipzig and Wien.

T. W. Davidson. Treatment of G.P. by Malaria. British Medical Journal, 1925, Vol. I, p. 452.

N. De Paoli e D. Pisani. Terapia nella paralisi progressiva. XVII Congresso della Societa Italiana di Freniatria, 1925.

H. F. Delgado. Tratamiento de la Paralisis General por el Metodo de Wagner v. Jauregg. Revista de Criminologia Psiquiatria y medicina legal. Ano VIII, 1921, p. 550.

S. Donner. Malaria Treatment of General Paresis. Finska Iökaresäll. Handlingar, Helsingfor, Vol. 67, 1925.

W. W. Eldridge. Treatment of Paresis—Results of Inoculation with the Benign Tertian Malaria. Journal of the American Med. Association, Vol. 84, 1925, p. 1097.

A. Ferraro and Th. C. Fong. The Serology of General Paresis in Malaria Treated Cases. Medical Journal and Record. November, 1926, p. 562.

O. Fischer, G. Hermann, Münzer and Potzl. Über die unzpezifischen Methoden zur Behandlung der Progressive Paralyse ecc. Medizinische Klinik, No. 45, 1923, p. 1485.
U. Fleck. Über die Malaria und Recurrens Behandlung der Paralyse. Archiv. für Psychiatrie und Nervenkr., Bd. 75, 1925, p. 563.
A. Fribourg-Blanc. Malaria Treatment of General Paralysis. Paris Médical, Dec. 1925, p. 453.
T. J. Furman. Treatment of General Paralysis. Archives of Neurology and Psychiatry, Vol. 12, 1924, p. 359.
A. Gans. Treatment of General Paralysis with Malaria Inoculation. Neurotherapie, Jg. 1923, p. 53.
J. Gerstmann. Über die Einwirkung der Malaria tertiana auf die progressiven Paralyse. Zeitsch. für die ges. Neurol. und Psych., Bd. 74, 1922, p. 242.
Id., Id. Über die jetzigen Stand der Malariatherapie der progressiven Paralyse ecc. Zeitsch. für die ges. Neurol. und Psych., Bd. 81, 1923.
Id., Id. Zur Frage der Umwandlung des Klinischen Bildes der Paralyse in eine halluzinatorisch—paranoide Erscheinungsform im Gefolge der Malaria behandlung. Zeitsch. für die ges. Neurol. und Psych., Bd. 93, 1924, p. 201.
Id., Id. Die Malaria behandlung der Progressiven Paralyse. Julius Springer, Wien, 1925.
C. Goria. Indagini e considerazioni sul decorso della p. p. trattata con la piretoterapia in associazione coi preparati di bismuto. Note e riviste di Psichiatria, Vol. XIII, 1925, p. 77.
Ilse Graf. Beiträge zur Malaria behandlung der progressiven Paralyse. Zeitsch. für die ges. Neurol. und Psych., Bd. 91, p. 131.
N. Graham. The Malaria Treatment of General Paralysis. The Journal of Mental Science, Vol. LXXI, 1925, p. 424.
A. R. Grant. The Treatment of General Paralysis. British Med. Journal, Dec. 1923, p. 698.
A. R. Grant and Silverston. Malaria Therapy in General Paralysis of the Insane. The Lancet, March 15, 1924, and Journal of Mental Science, Jan. 1924, pp. 81–88.
Grimme. Eigene Erfahrungen mit der Malaria behandlung der Paralyse. Allgemeine Zeitschrift für Psychiatrie, Bd. 83, 1926, p. 295.
S. Grossman. Wagner v. Jauregg Treatment of Dementia Paralytica. The Lancet, July, 1925, pp. 16–18.
G. Hermann. Malaria Treatment of G.P. Medizinische Klinik, March, 1925, p. 387.
Id. Über die Malaria Behandlung der juvenilen Paralyse. Medizinische Klinik, Jg. 20, 1924, p. 746.
Id. Jahresbericht über die Malaria Behandlung der progressiven Paralyse an der Deutsche Psychiatrischen Klinik in Prag im Jahre, 1923. Med. Klinik, 1924, p. 445.
E. Herzig. Zur Malaria Behandlung der Paralyse Progressive. Wiener Klin. Wochenscrift, Jg. 37, 1924, p. 88.
A. Hoche. Treatment of Progressive Paralysis. Schweizerische medizinische Wochenschrift, Feb. 1925, p. 133.
L. Horn. Serologische Beiträge zur Malaria Behandlung der Paralyse. Jahrb. für Psychiatrie und Neurol., Bd. 43, 1924, p. 247.
N. Jacob. Kurzer Bericht über Malaria Behandlung der progressiven Paralyse (Königsberg). Arch. für Psychiatrie, Bd. 71, p. 754.
E. Jansen und Hutter. Resultate der Malaria Behandlung der Dementia Paralytica. Psych. en neurol. bladen, Jg. 1924, p. 7.
P. Jossmann and P. Steenarts. Über Malaria Behandlung der progressiven Paralyse. Monatschrift för Psych. u. Neurolog., Bd. 56, 1924, p. 241.
H. Kaltenbach. Über einige prognostische Schlüsse aus den Liquoranalysen bei Malaria behandelten Paralytikern. Archiv. für Psychiatrie, Bd. 71, 1924, p. 384.

B. Kihn. Über einige Erfahrungen mit der Infektions behandlung der Progressiven Paralyse. Archiv. für Psychiatrie, Bd. 72, 1925, p. 287.
Id. Weitere Erfahrungen mit der Infektions Behandlung der progressiven Paralyse. Archiv. für Psychiatrie, Bd. 75, 1925, p. 656.
G. Kirby. The treatment of general paralysis with special reference to tryparsamide and malaria treatment. State Hospital Quarterly, August, 1926.
W. Kirschbaum. Über Malaria und Recurrenzfieber Behandlung bei progressiven Paralyse. Zeitsch. für die ges. Neurol. und Psych., Bd. 75, 1922, p. 635.
Id. Methoden und Kautelen einer Malaria Blut—Konservierung und Versendung, ecc. Klin. Wochenschrift, Lg. 2, No. 30, 1923.
W. Kirschbaum und H. Kaltenbach. Weitere Ergebnisse bei der Malaria Behandlung der Progressiven Paralyse. Zeitsch. für die ges. Neurol. und Psych., Bd. 84, 1923, p. 297.
L. Kirschner und F. Van Loon. Über Malaria Behandlung der Dementia paralytica in den Tropen. Geneesk. tijisch v. Nederlandsch. Fredi., Bd. 64, 1924, p. 451.
N. C. Lewis, Hubbard, Dyar. The Malaria Treatment of Paretic Neurosyphilis. American Journal of Psychiatry, Vol. 4, 1924–25.
G. A. Lilly. The Treatment of General Paralysis at Hanwell Mental Hospital. The Journal of Mental Science, April, 1925, p. 267.
W. McAlister. Malaria Infection in Treatment of General Paralysis. British Med. Journal, Oct. 1923, p. 696, and J. of Mental Science, Vol. 70, 1924.
H. McBride and L. Templeton. The Treatment of General Paralysis of the Insane by Malaria. The Journal of Neurolog. and Psychopath., Vol. V, 1924.
C. Mayer. Discussion of the Paper of Nonne: Die Behandlung der Spät und Metalues. Allg. Zeitschrift für Psych., Bd. 81, 1925, p. 130.
G. Mingazzini. Id., Id.
Id. Sulla cura moderna della lues e della Metalues Nervosa. Biologie Medicale, No. 7, 1925.
Mühlens und Kirschbaum. Parasitologische und Klinische, Beobachtungen bei Künstliche Malaria und Recurrens übertragungen. Zeitsch. für Hygiene und Infektionskr., Bd. 94, 1921.
Mühlens, Weygandt-Kirschbaum. Die Behandlung der Paralyse mit Malaria und Recurrens fieber. Münch. Mediz. Wochenschrift, 1920, No. 29, and Allg. Zeitsch. für Psychiatrie, Bd. 76, 1920–21, p. 652.
G. Modena e N. De Paoli. Tentativi di cura della paralisi progressiva con innesti di malaria terzana. Policlinico Sez. pratica, 1924, p. 289.
Mühlens und Kirschbaum. Weitere parasitologische Beobachtungen bei Künstlichen Malaria infektionen von Paralytikem. Archiv. für Schiffs u. Tropenhyg., Bd. 28, 1924, p. 131.
F. C. Münzer and E. Singer. Malaria Treatment of General Paralysis. Medizinische Klinik, 1925, p. 247.
E. Nicolle et J. Steel. Le traitement de la G.P. par la malaria. L'Encephale, XXI Année 1926, p. 116.
Id., Id. Acquired Immunity to Malaria Treatment. The Journal of Mental Science, Jan. 1926, p. 66.
M. Nonne. Die Behandlung de Spät und Metalues. Allgemeine Zeitschrift für Psych., Bd. 81, 1925, p. 15.
Id. Meine Erfahrungen ueber die Malaria Behandlung der Paralyse. Medizin. Klinik, 21 Dec. 1925.
Id. Bemerkungen zur Infektions therapie der progressiven Paralyse. Zeitsch. für die ges. Neurol. und Psych., Bd. 94, p. 506.
Nyirö, Gyula and Sandor Stief: Die Malaria tertiana Behandlung der progressiven Paralyse. Orvosi Hetilap. Jg. 68, 1924, p. 757.
R. Nyssen. A propos de l'inoculation de la malaria par voie endoveineuse. Journal de Neurologie et de Psychiatrie, 1925, p. 569.

A. O'Leary, H. Goeckerman and S. C. Parker. Treatment of Neurosyphilis by Malaria. Archives of Dermatology and Syphilology, March, 1926, p. 301.
N. De Paoli. Osservazioni clinico terapeutiche sulla paralisi progressiva. Relazione al XVII Congresso della Sta Italiana di Freniatria.
Pastrovitch. Discussion on the paper of N. De Paoli.
A. Pilcz. Von Wagner's new treatment of general paralysis. The Lancet, 1923, p. 19.
A. Pijper and B. D. Russell. Incubational changes in the red cell count on inoculated malaria. The British Medical Journal, Vol. II, 1924, p. 620.
F. Plaut and G. Steiner. Recurrens infektion bei Paralytikern. Zeitschrift für de ges. Neurol. und Psych., Bd. XIII, 1920, p. 103.
Id., Id. Die Recurrens behandlung der syphilogenen Nerven-krankheiten. Zeitsch. für die ges. Neurol., ecc., Bd. 94, 1925, p. 153.
Id., Id. Zur Geschichte und Begründung der Recurrens therapie bei Paralyse. Zeitschrift für die g. Neurologie und Psych., Bd. 75, 1922, p. 686.
Plehn. Malaria treatment of General Paralysis. Deutsche Mediz. Wochenschrift, Dec., 1924, p. 1827.
O. Pötzl. Über die Bedeutung der Liquorveränderung und Verlauf der Wagner v. Jaureggschen Behandlung der Progressiven Paralyse. Medizinische Klinik, 1923, p. 1515.
W. Raynor. Remissions in general paralysis. Archives of Neurology and Psychiatry, Vol. 12, Oct., 1924, p. 419.
H. Reese und K. Peter. Die Einwirkung der Malaria Tertiana auf die progressive Paralyse. Med. Klinik, Jg. 20, No. 12, 1924, pp. 372 and 410.
G. M. deRudolph. The malaria treatment of G.P. Some psychological and physical observations. Journal of Mental Science, Vol. LXXI, 1925, p. 30.
Id. The incubation period of benign tertian malaria. The Journal of Mental Science, Vol. LXXII, 1926, p. 69.
Runge. Discussion of the paper of Weygandt. Allg. Zeitsch. für Psychiatrie, Bd. 77, 1922.
Sagel. Discussion of the paper of M. Nonne. Allg. Zeitsch. für Psychiatrie, Bd. 81, 1925.
Schuster. Id., Id.
G. Santangelo. Per la malarioterapia della demenza paralitica e la sua applicasione in pratica. Note e riviste di psichiatria, Vol. XIV, 1926, p. 63.
V. Scarpini e C. Befani. La cura della paralisi progressiva con l'inoculazione della malaria. Rassegna di studi psichiatria. Vol. XIV, 1925.
G. Scherber und O. Albrecht. Die Wirkung der malaria in Verbindung mit spezifischer Behandlung auf die syphilitischen Erkrankungen des Zentralnervensystem. Medizinische Klinik, 1924, p. 1287 and 1327.
C. Schilling. Malaria Behandlung der Paralyse. Deutsch Kolonial Kongr. Sitz 18, 1924.
Schulze. Malaria Behandlung der Paralyse. Deutsch Kolonial Kong. Sitz v. 18, 1924.
F. W. Scripture. The treatment of general paralysis by Malaria. The Journal of Mental Science, Vol. LXIX, 1925, p. 77.
A Solomon and A. Berk. Malaria in the treatment of General Paresis. Journal of Nervous and Mental Disease, Vol. 63, 1926, No. 3.
J. Purves Stewart. The treatment of General Paralysis, British Medical Journal, 1924, Vol. I, p. p. 508.
W. Templeton. The treatment of General Paralysis by Malaria. British Medical Journal, 1923, p. 895.
H. Tophoff. Über Remissionen bei der progressiven Paralyse. Zeitschrift für die gesamte Neurologie, Bd. 91, p. 190.
R. Untersteiner. Erfahrungen über die Malaria Behandlung der progressiven Paralyse. Wiener Klin. Wochensch., Jg. 37, 1924, p. 499.

Wagner v. Jauregg. Die Einwirkung der Malaria auf die Progressive Paralyse. Psychiat.-neurol. Wochensch., Bd. 20, p. 132, 1918–19.

Id., Id. The treatment of general paresis by inoculation of malaria. J. of Nerv. and Mental Diseases, Vol. 55, 1922, p. 369.

R. Weichbrodt. Incubation period of malaria inoculation. Deutsche Medizin. Wochenschrift, p. 1949.

R. Weichbrodt und Jahnel. Einfluss höher Körper Temperaturen auf die Spirochäten und krankheiterscheinungen. Deutsch. Med. Wochensch., No. 18, 1919.

Weygandt. Mitteilungen über Paralyse Behandlung. Allg. Zeitschrift für Psychiatrie, Bd. 77, 1922.

Id. Zur Malaria Behandlung der Paralyse. Allg. Zeitsch. für Psychiatrie, 1923, Bd. LXXIX, p. 482.

A. Wizel et L. Prussak. Le traitement de la paralysie générale par l'inoculation du paludisme. L'Encephale XX Année, Mai, 1925.

C. Worster-Drought and H. G. Beccle. The treatment of G.P. of the insane by malaria infection. British Med. Journal, 1923, Vol. II, p. 1256.

W. Yorke and J. W. Macfie. Observations of malaria made during treatment of general paralysis. The Lancet, Vol. CCVI, 1924, p. 1017.

M. Zalla. La cura malarica della paralisi progressiva. Rinascenza medica, Anns I, 1924, p. 374.

THE EXPERIMENTAL STUDY OF PACHYMENINGITIS HEMORRHAGICA *

By Tracy Jackson Putnam, M.D.
and
Irma Kellers Putnam, M.D.
of boston, mass.

Definition and Terminology: The term *pachymeningitis hemorrhagica interna* has been used rather loosely to designate various types of hemorrhagic exudation on the inner surface of the dura mater. Virchow (17), who introduced the name, employed it to describe a progressive lesion, in which the formation of a very vascular subdural membrane was apparently followed by larger or smaller ecchymoses, or by a subdural hematoma. In the cases which he studied, there was no history of trauma, and no definite evidence of a preceding hemorrhage, so that he believed the process represented the organization of an inflammatory fibrinous exudate. This interpretation of the histological appearances has been questioned by other observers, and a large number of cases has been reported in which a somewhat similar histological and clinical picture has been the undoubted result of trauma to the head. The subject has been reviewed at length in a recent paper, from the clinical, surgical and pathological point of view (12). In general, two chief types of hemorrhagic membrane are seen. In one, the *nontraumatic, idiopathic,* or vascular type, the membrane is composed of a network of large blood vessels, which have the structure of capillaries, although they may reach a diameter of 40 micra or more. Such membranes are frequently seen in chronic alcoholics and in the insane, without a history of trauma. The rarer type, sometimes called *traumatic*, but perhaps better *reactive,* is oftenest seen following injury to the head, and is characterized histologically by the presence of irregular blood-filled spaces, much larger than the "giant capillaries" described above, which anastomose with each other and with the apparently normal capillaries seen elsewhere in the neomembrane. The reactive type of membrane is apparently always preceded by a subdural hemorrhage, but the vascular type may be found either with

* From the Laboratory of Surgical Research, Harvard Medical School.

or without hemorrhage. Both are remarkable clinically for the reason that a well-developed and apparently old lesion may be found at operation or autopsy on a patient whose symptoms are of very recent date. Illustrations of both types of membranes, and further particulars concerning them, are given in the paper just referred to (12).

Other types of subdural membrane are seen, but need not be considered here.

Methods of Study: In addition to pathological, clinical and surgical studies of subdural membranes, a number of attempts have been made to elucidate the mechanism of their formation by experimental means. The simplest and most obvious experiment is the subdural injection of blood or of irritating substances. A similar means of investigation is the examination of a series of duras from patients dying at various intervals of time after intracranial operations. Finally, the frequent concurrence of pachymeningitis and chronic alcoholism has suggested the study of the duras of animals fed alcohol over long periods.

The Subdural Injection of Blood: This experiment was first tried by Serres (15) in 1819. He tore the longitudinal sinus subdurally, and found that the animals developed convulsions and hemiplegia within a few hours, and when they were sacrificed a day or so later, a mass of fluid blood contained in a fibrinous sac was found adherent to the dura. Similar experiments were performed by Laborde (6) and Wilks (19), but in none of these cases was there any histological examination.

The most important experiments were those of Sperling (16). In his experiments, performed apparently without particular regard to asepsis, he rongeured away the skull of rabbits, and injected blood beneath the dura with a syringe and blunt needle. He states that injury to the arachnoid was avoided because the dura was bulged out by fluid; it is possible, therefore, that his cannula was sometimes subarachnoid rather than subdural. The wounds seldom suppurated, and when the animal was sacrificed a few days to a month later, in almost every case the inner surface of the dura was covered by a thin brown membrane which was vascular. The author gives no illustration of the membrane and it is not possible to be sure from his description whether the appearances he found coincided with those seen in human cases or not. His experiments were repeated by van Vleuten (18) who was already committed to the opinion that traumatic subdural effusions did not lead to a hemorrhagic pachymeningitis. Van Vleuten's experiments were conducted under aseptic

conditions, and he found the subdural injection of blood was sometimes followed by the formation of a membrane. He states that the same result was seen, however, after simple trephining, without injury to the dura, and denies that the pachymeningitis was produced by the blood. He also fails to illustrate or describe the microscopic appearances produced. The same criticism may be directed at the experiments of Marie, Roussy, and Laroche (9), in which the injection of blood alone failed to reproduce a pachymeningitis in nine animals. Injection of blood and an irritating mixture of fatty acids produced a laminated hemorrhage in one animal and thickening of the dura in several others; but no histological descriptions are given, and the operative technique is described only briefly. As may be seen below, similar gross appearances can be produced by the subdural injection of blood alone, in a comparable proportion of cases, and it does not seem necessary to suppose that the fatty-acid mixture had much to do with the result.

Repetition of Previous Experiments: As similar experiments have led to diametrically opposite conclusions in the hands of various observers, it seemed worth while to repeat them under as rigid control as possible.

Technique: Fifteen cats and three dogs were operated upon. One cat and one dog succumbed the day of the operation, and may be excluded from the series.

The operative procedure was essentially the same in all cases. Ether was used as anesthetic. The temporal muscle was turned down from its origin and a trephine opening 1 to 2 cm. in diameter was drilled in the angle between longitudinal and transverse sinus. Blood was sucked from the wound with a 1 or 2 c.c. paraffined syringe. A 19 gauge needle was fitted to the syringe, and its point inserted obliquely through the dura. In three cases at least, and perhaps in others, the needle was inserted into or through the arachnoid, and no trace of the blood was found subdurally at autopsy, but only an adhesion of the dura to the cortex. This is a point where mistakes are easily made and they may explain some of the discrepancies between previous reports. The blood was injected as promptly as possible, causing the dura to bulge through the trephine opening. Sometimes the needle-hole had to be plugged with muscle to prevent the blood from escaping, as it would spurt out with some force if not clotted. The wound was closed carefully in layers. In spite of precautions, several of the animals became infected. This appeared to make no difference in the lesion produced. They showed no definite neurological symptoms, and ophthalmoscopic examination revealed

no choked discs. Conjugate deviation of the eyes was seen in one animal whose cortex had been damaged by the needle.

Owing to the difficulty of keeping fluid blood beneath the dura, *washed fibrin* in amounts up to half a gram was inserted through a tiny slit in some of the later animals. This proved a more satisfactory technique, and the lesions produced were similar. Defibrinated blood was also injected beneath the dura in several experiments, on the opposite side of the head from the fibrin. It showed a great tendency to leak out through the tiniest rent in either arachnoid or dura, and even when the puncture made by a fine needle was plugged with a bit of muscle, no trace of the blood could be found at autopsy.

Injection of Subdural Spaces: In several experiments, an attempt was made to identify the implanted clot or fibrin by mixing it with Prussian blue or India ink. The resulting histological picture was not greatly clarified, but a definite injection of the subdural space occurred. The dye or ink diffuses over the entire hemisphere, but is arrested at the border of the longitudinal and transverse sinuses, and along the basal sinuses. None of it crosses the midline or reaches the tentorium. The ink becomes collected in small aggregations.

The animals were sacrificed at intervals varying from one day to three months, usually by etherization. Paraffine sections were taken through the center of the membrane, and stained with hematoxylin or methylene blue and eosin, and in some cases with Perdrau's silver connective tissue stain, and Weigert's stain for elastic tissue. In several experiments, a capillary injection with India ink was made and pieces of dura were cleared by Spalteholtz' method. In two dogs, specimens of the membrane were removed at a second operation seven and eight days after the first, the defect was closed with fascia, and the animals sacrificed ten and eight days later respectively.

Result of Experiments: In five of the eighteen cases there was no trace of a membrane, or at most slight injection and roughening of the dura. In three of these it seemed evident that the blood had been injected beneath the arachnoid. In all cases, much less clot was found than might have been expected from the amount of blood introduced. Even the collections of fibrin inserted beneath the dura appeared to have diminished. The coagulum was always adherent to the dura, and bound to it by a thin membrane fading out over the dural surface. Adhesions to the arachnoid were rarely seen.

Microscopic Examination: Within five days after the injection of blood a thin neomembrane of fibrous tissue covered with mesothelium is usually found covering the surface of the clot toward the arachnoid. Traces of it can still be made out in sections from a cat

sacrificed fifty days after the injection of blood, but it has begun to become fused with the organization tissue growing up beneath it (Fig. 1). The mesothelial covering over a scar is all that is left of it after three months. It was never found vascularized. The neomembrane covering the clot is, then, a much less constant and

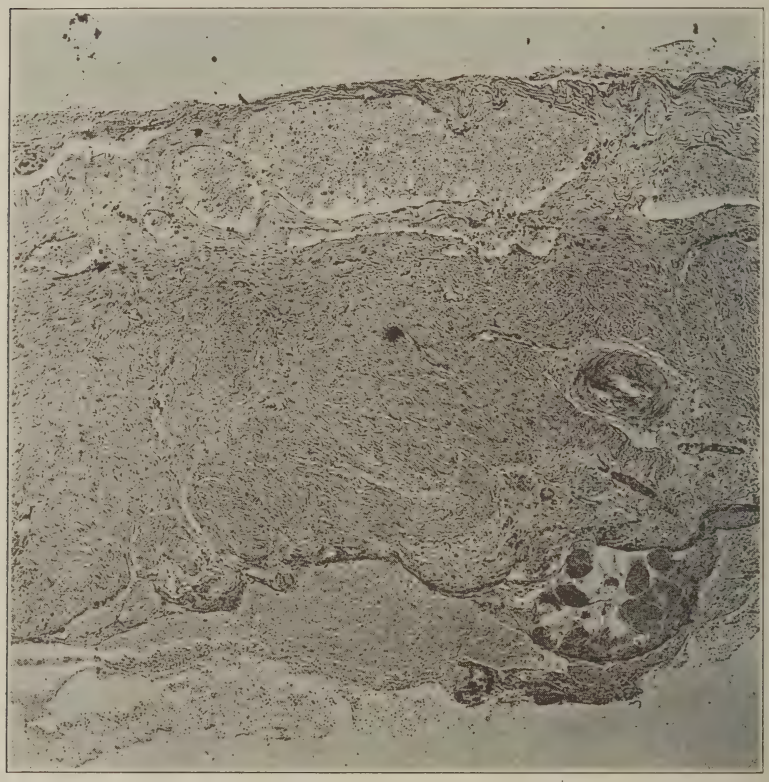


FIG. 1. A cat was trephined, and 2 c.c. of whole blood were injected beneath the dura. The animal was sacrificed 50 days later. The section shows the entire thickness of the dura and subdural membrane (at the top of the photograph). The free surface of the fibrous scar is covered by a mesothelial membrane. The boundary between the dura and the new-formed tissue is marked by an arrow. A series of lined spaces, filled with serum, cells and debris lies along the dural surface. A small bit of muscle placed to control operative hemorrhage is seen at the bottom of the picture. Hematoxylin and eosin. ×80.

striking feature of the microscopic picture than that seen in the human cases, but is perfectly comparable with it.

The *clot* itself shows the usual regressive changes. Fibrin is laid down mainly along the surfaces, and in coarse columns traversing the mass. Rounded spaces are often seen in its meshes. They are usually empty, but may contain cells or serum.

The distinction between the clot itself and the *subdural membrane* of granulation tissue is less definite than in the human cases, where the two are readily separated. But in animal experiments the clot is so thin that it is usually found completely traversed by connective tissue, if it is organized at all. The membrane is composed of fibrous tissue whose density increases with its age. Leucocytes or newly

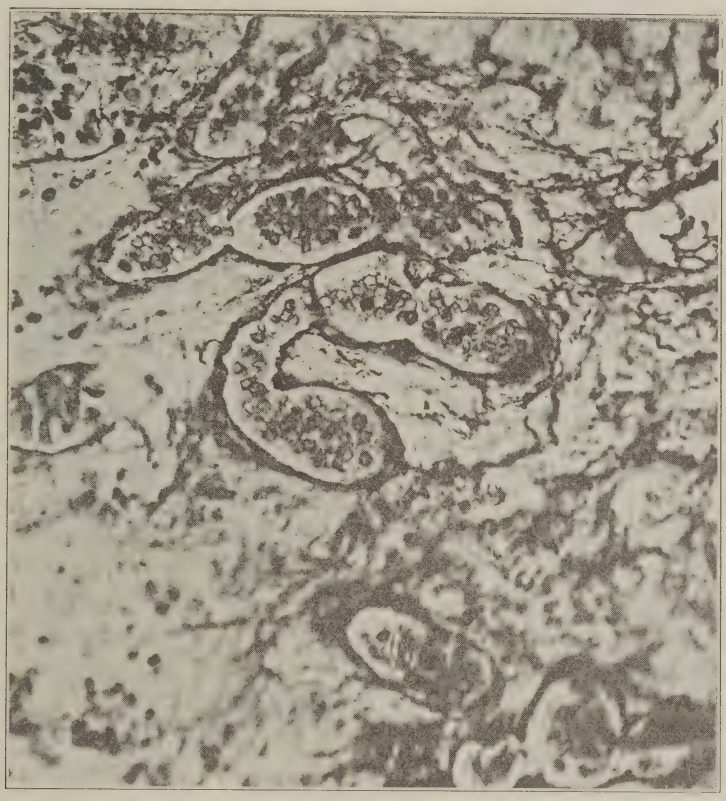


FIG. 2. Specimen removed at secondary operation, 8 days after the subdural injection of 4 c.c. of blood in a small dog. Tortuous, dilated, thin-walled capillaries are invading the thick clot (Cf. Figure 3). Perdrau's stain. ×300.

extravasated red cells are rarely found. Vessels are seldom seen in specimens taken a week or less after the injection, but coarse, tortuous capillaries were found in a membrane removed at a secondary operation eight days after the first in one dog. At the second operation a greenish, gelatinous coagulum about 0.5 cm. in thickness, between two thin friable membranes was found beneath the dura. This lesion resembled that of spontaneous pachymeningitis more than any of the others produced (Fig. 2). Only a small section of it was

removed, but at autopsy 10 days later, it was found firmer, paler, reduced almost a half in thickness and distinctly less vascular than before (Fig. 3). Usually the vascularity is not striking (Fig. 4).

An almost constant feature of the experimental subdural membranes is the presence of *mesothelial lined spaces,* usually empty,

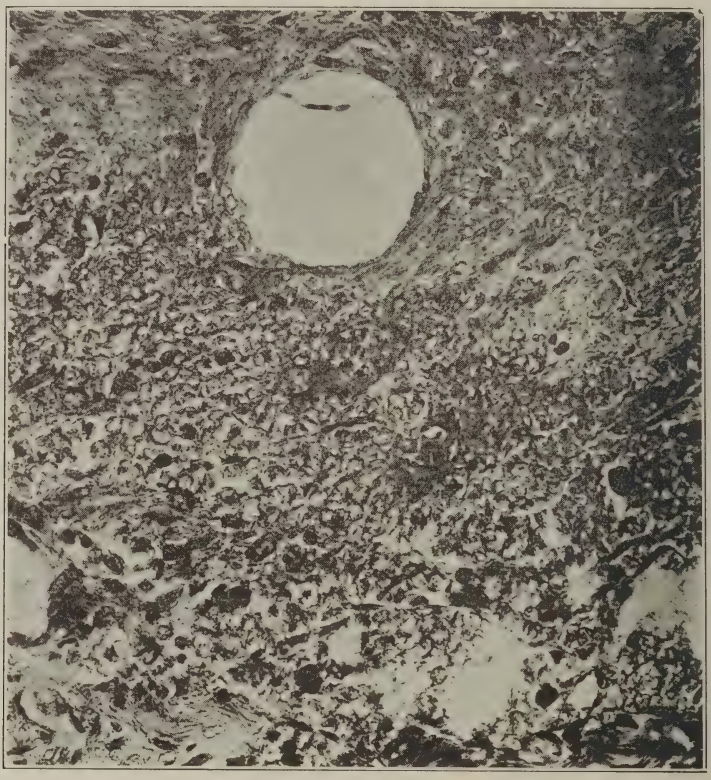


Fig. 3. The same dog from which the previous specimen (Fig. 2) was taken. The present section was removed at autopsy 9 days after the secondary operation. Capillary injection with India ink. The tissue is much denser, and the vessels, filled with ink, are smaller. The lining of a typical empty space in the center of the photograph is well demonstrated. Hematoxylin and eosin. ×300.

sometimes containing a little blood or debris (Fig. 1). They are similar in appearance to some of those seen in human cases, excepting that they may occur anywhere throughout the membrane, and that they have not been observed to connect with blood vessels. Ink was never found in them, even after a successful capillary injection (Figs. 3 and 4). They appear to occur wherever a pocket of serum, cells or air is enclosed by fibrin. The fibrin becomes organized and

the space is left. A sort of mesothelium appears to be formed from the fibrous tissue (Fig. 3). There is sometimes a row of them along the surface of the dura as in the human cases, suggesting either that this is a favorite location for such lakes of fluid, or that the dural mesothelium has something to do with their formation (Fig. 1).

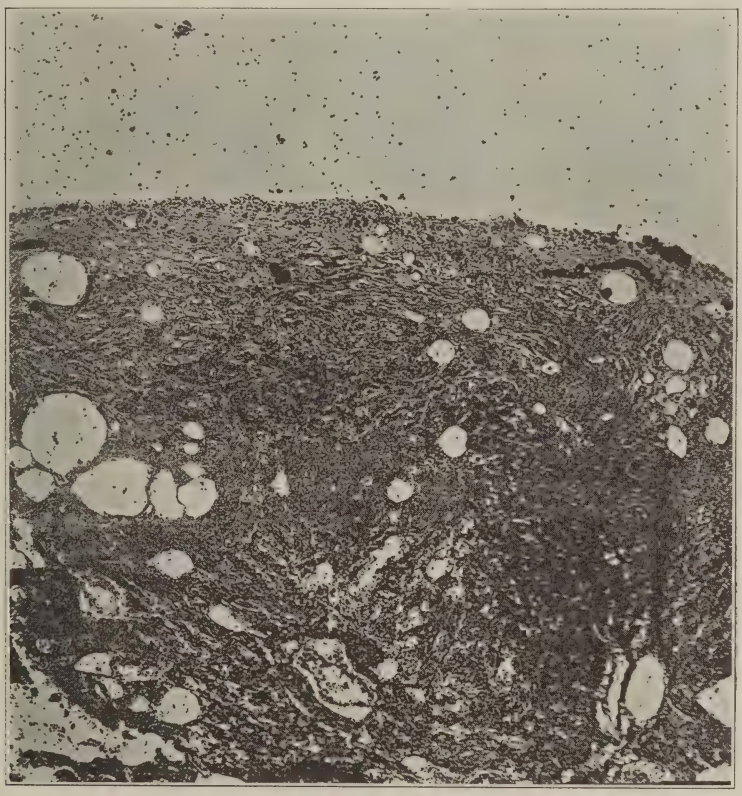


FIG. 4. Specimen removed at autopsy 10 days after the insertion of washed fibrin beneath the dura of a dog. Capillary injection with India ink. To show the general appearance of the lined empty spaces, and their relation to the ink-filled blood-vessels. Dura and capsule not shown. Hematoxylin and eosin. ×80.

Such spaces probably have a special significance in the pathology of true vascular pachymeningitis. Comparable spaces are rarely found in hematomas elsewhere in the body, as for example, in those seen external to the dura.

Bacteria was never found in the sections stained with methylene blue. The Perdrau connective tissue stain sometimes showed the presence of fibrous tissue and vessels before it could be detected by

other methods, and demonstrated the fibrous framework of the large empty spaces. Elastic tissue was never found in the new-formed membrane, and indeed was seen only in the vessels of the dura.

To sum up, we may say that experimental subdural hematomas are distinguished from those seen elsewhere by (a) the presence of a thin mesothelial neomembrane between the clot and the arachnoid, (b) by rather unusual vascularity in some cases, and (c) by the presence of large, empty, endothelial-lined spaces. These peculiarities are also seen in traumatic subdural hematomas. Subsequent spontaneous hemorrhages did not occur in any of the experiments. It is probable that they do occur in traumatic cases in human beings.

Attempts to Produce Secondary Hemorrhages in Experimental Hematomas: In many of the histories of patients with traumatic hematoma of the dura, the appearance of secondary symptoms appears to follow some unusual exertion, after a latent period of a week or longer. Thus, a patient who has been comfortable for two weeks in bed after a trauma to the head, will develop headaches, convulsions, or hemiparesis on getting up. It is difficult not to suppose that in such a case a rise of blood pressure with a simultaneous fall of intracranial pressure has been sufficient to rupture a capillary or dislodge a small thrombus, as has often been suggested. A reduction of cerebrospinal pressure can be produced by spinal puncture, or more conveniently in cats, by the intravenous injection of concentrated (30 per cent) saline solution. The latter procedure was the one employed in three experiments, without, however, producing any definite change in the condition of the membrane at autopsy a few hours later. An attempt was also made to raise the blood pressure in the head by mechanical means, by rotating etherized animals on a turn-table, a method similar to that used by Mendel (10) on dogs, and by Forel (3) on human subjects. Mendel believed that he produced a pachymeningitis as well as chronic degenerative changes in the brain by this maneuver. A subarachnoid hemorrhage occurred in one of our animals, but no fresh hemorrhage in a hematoma, or from the under surface of the dura.

Pachymeningitis with small hematomas is sometimes seen during the course of hemorrhagic diseases, such as pernicious anemia, leukemia and purpura. Two cats in which experimental subdural hematomas had been produced were bled, and the blood defibrinated and reinjected progressively until it came uncoagulable from the artery; but when sacrificed an hour later, they showed no fresh hemorrhage in the granulation tissue lining the dura.

The Subdural Injection of Irritating Substances: A considera-

tion of the course and pathology of human cases of pachymeningitis makes it seem improbable that any local irritant plays a part in its etiology. A great variety of irritating substances has been injected subdurally by various experimenters, among whom may be mentioned Sperling (16), van Vleuten (18), and Marie, Roussy and Laroche (9). The injection has almost invariably been followed either by suppuration or by a fibrous scar and adhesion. Van Vleuten believed that he produced a mild pachymeningitis by the injection of acetic acid, but he gives no histological description of it, and evidently no hematoma was formed. A criticism of the experiment of Marie, Roussy and Laroche has already been given. It did not seem worth while to repeat these investigations.

The Fate of Subdural Hemorrhages in Human Beings: Van Vleuten (18) made a study of the process of organization of subdural hematomas in patients dying within a few days after a fracture of the skull. He always found organization of the clot by tissue which was usually vascular, but less so than the membrane of spontaneous pachymeningitis. He found no tendency to progressive hemorrhage, and observed a fibrous scar at the probable site of a subdural hematoma in a man dying fourteen years after a trauma to the head. He mentions the presence of mesothelial-lined spaces and of a mesothelial covering over the free surface of the hematoma, but did not have the opportunity of comparing such membranes with those found in patients dying after a progression of symptoms following trauma. He concluded that pachymeningitis did not result from a simple subdural hemorrhage. Böckmann (2) examined the duras of fifty-seven patients dying after various intracranial operations in which blood was presumably extravasated beneath the dura. The patients died at intervals of a few hours to two months post-operative; there was local sepsis in several of the cases. In two cases, the remains of a hematoma was found, but with little vascularity. He made no mention of lined spaces or of a membrane over the free surface of the clot. He agreed with van Vleuten in believing that a subdural hemorrhage does not lead to pachymeningitis. Neither of these authors give any illustrations.

Material from the Surgical Service of the Peter Bent Brigham Hospital afforded an opportunity to repeat Böckmann's investigation. Specimens were taken from the preserved duras of eighteen patients who had died at various intervals after intracranial operations during the past three years. Only those cases in which the dura was opened were taken, but the cases were otherwise unselected, and represent a majority of the post-operative fatalities during that period. The

interval between operation and death varied from a few hours to three months, with an average of about twenty days. Meningitis was present in one case of brain abscess. Extradural hemorrhage of greater or less extent was found in almost all cases dying within a fortnight after operation. Shreds of fibrin or tags of clot were frequently seen in patients dying a day or two post-operative, but the amount was always surprisingly small. Rarely a definite pigmented scar was found, but never a lesion of significant size. Thus little positive evidence was obtained from the gross appearance of the dura.

Blocks were taken of whatever clot was present, or from the vicinity of the operative wound. They were embedded in paraffin, cut transversely and stained with hematoxylin and eosin, with Weigert's elastic tissue stain and with Perdrau's stain for connective tissue.

In three cases no definite subdural exudate was found. In nine small amounts of fibrin and red cells were seen without any evidence of organization; in one case as long as four days after operation. A definite mesothelial covering over the free surface was found in this case before any growth of granulation tissue from the dura could be detected. Four cases showed organization, but vascularity was never marked. A mesothelial neomembrane over the surface toward the arachnoid was seen in only two instances; it is possible that it had become rubbed off in specimens which had been preserved for a long time.

Definite mesothelial-lined spaces, such as described and pictured above as occurring after the subdural injection of blood in animals, and in another paper (12) as occurring in human cases of pachymeningitis, occurred in seven of the eighteen cases. They were usually much smaller than those seen in animal experiments, but were unmistakably similar. Occasionally they contained a few red cells, but they never appeared to connect with blood vessels. An illustration of a post-operative subdural clot, with spaces and a mesothelial membrane, is given in the paper just referred to (l.c., Fig. 8).

Our findings agree with Böckmann's then, in that the subdural clots in our cases were always small, and never showed evidence of progressive or repeated hemorrhage. On the other hand, they did show the mesothelial-lined spaces which apparently play an important part in the etiology of recurrent bleeding, and which are rare in hematomas elsewhere in the body.

Pachymeningitis in Experimental Chronic Alcoholism: The production of chronic alcoholism in animals is an old experiment which has been repeated many times under rigid control. A summary and criticism of the entire question is given by Saltykow (14). Valuable

references may be found in this article, but there are some inaccuracies in the figures quoted. Huss (4) speaks of Dahlstrom's production of an "*ausschwitzung*" between dura and pia in dogs, by feeding six ounces of alcohol daily for eight months. Kremiansky(5), who was well acquainted with the appearance of pachymeningitis in human subjects, produced a similar picture in three out of four puppies by feeding them an ounce of brandy (45 per cent alcohol) daily for two to five months. Neumann (11) and Lewin (7) each saw only one case in a number of experiments which is not definitely stated. Lewin's case was that of a large rabbit fed 380 c.c. of 95 per cent alcohol during sixty-six days; the membrane was the thickness of an egg-skin. Magnan (8), Ruge (13) and Afanassijew (1) were unable to produce a subdural membrane in a long series of comparable experiments, but often saw a hyperemia of the vessels of the dura.

It is evident from a survey of the literature that there is considerable disagreement as to what constitutes pachymeningitis, but that a subdural hematoma has not been produced by chronic alcoholic intoxication. These experiments were not repeated in the present study.

Summary and Conclusion

Apparently a true, progressive chronic hematoma of the dura has never been produced experimentally. The lesions seen after the subdural injection of blood and in patients after operation resemble the progressive lesion in appearance, but not in behavior. It was suggested in a previous paper that the progressive nature of the lesion seen in human beings was due to the establishment of connections between the blood vessels and the empty spaces which occur commonly in subdural hematomas; but there appears to be no way of testing this supposition experimentally.

If we accept a sufficiently broad definition of what constitutes pachymeningitis, we can find examples of it following various experimental procedures in animals. The most important of these are the subdural injection of blood or fibrin, and chronic alcoholic poisoning. But there is no evidence that the lesion so produced is progressive.

Experimental studies have so far added little to the knowledge of progressive subdural hemorrhage which has been gained by clinical and pathological observation.

Grateful acknowledgment is due to Dr. Harvey Cushing for pathological material from patients on his service, for permission to work in his laboratory, and for help in many other ways.

REFERENCES

1. Afanassijew. Zur Pathologie des Alkoholismus. Beitr. z. path. Anat., 10:443, 1890.
2. Böckmann, E. Ein Beitrag zur Aetiologie des Pachymeningitis interna haemorrhagica. Arch. f. path. Anat., etc., 214:380–388, 1913.
3. Forel, O. L. Contribution à l'étude des traumatismus cérébraux. Schweiz. Arch. f. Neurol. u. Psych., 4:170, 1919.
4. Huss, M. Alkoholismus chronicus. Leipzig u. Stockholm, 1852.
5. Kremiansky, J. Ueber die Pachymeningitis interna haemorrhagica bei Menschen u. Hunden. Arch. f. path. Anat., 42:129–161, 321–351, 1868.
6. Laborde, J. Contribution à l'étude des conditions pathogéniques des kystes sanguines de l'arachnoide; recherches expérimentales sur les animaux. C. r. Soc. de biol., Paris, 1864, p. 70.
7. Lewin. Ueber die Wirkung des Alkohols, etc. Centralbl. f. d. med. Wissensch., 1874, p. 593.
8. Magnan. Gazette médicale, Paris, 1869, No. 5.
9. Marie, Roussy and Laroche. Sur la réproduction expérimentales des pachyméningites hémorrhagiques. C. r. Soc. de biol., Paris, 74:1303, 1913.
10. Mendel. Syphilis u. Dementia paralytica. Klin. Wochenschrift, Berlin, 1885, No. 34, p. 549.
11. Neumann, E.-A.O. Ueber die Pachymeningitis hemorrhagica bei der chronischen Alcoholvergiftung. Königsberg, 1869, 8°.
12. Putnam, T. J. Chronic Subdural Hematoma. Arch. Surgery, 11, 329–393, 1925.
13. Ruge, P. Die Wirkung des Alkohols auf der thierischen Organismus. Arch. f. path. Anat., etc., 49:252, 1870.
14. Saltykow. Alkoholismus chronicus (Referat.). Centralbl. f. allg. Path., 22:849, 1911.
15. Serres, A. Nouvelle division des apoplexies. Annuaire méd.-chir. des hôp., Paris, 1:246, 1819.
16. Sperling, H. Ueber Pachymeningitis haemorrhagica interna. Inaug. diss. Königsberg, 1872. (Summarized briefly in: Centralbl. f. d. med. Wissensch., Berlin, 9:449, 1871.)
17. Virchow, R. Haematoma durae matris. Verhandl. d. phys.-med. Gesells., Würzburg, 7:134–142, 1857.
18. Van Vleuten, C. F. Ueber Pachymeningitis haemorrhagica interna traumatica. Inaug. diss., Bonn, 1898.
19. Wilks. Med. Times and Gazette, London, 1868.

THE NEUROPATHOLOGICAL FINDINGS IN A CASE OF ACUTE SYDENHAM'S CHOREA

By Lloyd H. Ziegler, A.M., M.D.

COLORADO PSYCHOPATHIC HOSPITAL, DENVER

New interest has been aroused in chorea in the last decade despite the discouraging diversity of reports concerning its pathology. This has undoubtedly come about as a result of the possible relationship which chorea may have to epidemic encephalitis and other diseases causing involuntary motor disturbances. Because of the relative infrequency of opportunity to study the neuropathological findings in acute Sydenham's chorea, the following case should prove of interest.

Clinical History of E. L.—A high school girl, seventeen years of age, was admitted to the clinical service of the Colorado Psychopathic Hospital on April 8, 1925, in an unconscious condition. Her family history was apparently negative. She had always been well except for occasional tonsillitis. Two months previous to admission she had had a severe tonsillitis from which she made a poor recovery. Occasionally after that attack she had rheumatic pains in her extremities, was irritable, and felt that she could not concentrate on school work as well as before her illness. Two weeks before admission she began to show irregular, incoördinate, purposeless movements. These apparently increased up to two days before admission, when she became unconscious. On admission she was in coma. Her temperature was 106.4° F. (rectal). She showed considerable loss of flesh. Muscle tone was poor. There were many irregular, purposeless, jerking movements over the body. The jaw, face, and neck muscles were especially involved. The elbows were excoriated from restlessness. The tendon reflexes showed no abnormality so far as could be determined. The Babinski sign was negative. There were no muscular atrophies. The pulse was 120. The heart was enlarged. A loud systolic murmur was heard in the mitral area. Blood pressure was 100/60. It was impossible to see the tonsils. The teeth were dirty. A clinical diagnosis of acute Syndenham's chorea and acute endocarditis was made. Laboratory studies of the blood gave hemoglobin, 90; red cells, 4,390,000; leucocytes, 15,200. The differential count showed polymorphonuclears, 73 per cent; small lymphocytes, 13 per cent; large mononuclears, 14 per cent. The spinal fluid studies showed 2 cells per cu. mm.; globulin negative; sugar normal; Wassermann 00 with .6; gold curve, 3455544450. A

urine specimen was not obtained; the patient was incontinent. Blood chemistry and blood culture were not done. The patient's temperature varied between 106.4° F. and 100.2° F. (rectal), falling as she approached death. She remained comatose and died on April 11, 1925, three days after admission.

Autopsy Findings.—Unfortunately the autopsy was limited to the brain, which was removed about nine hours after death. The brain was fixed in 10 per cent formalin. Grossly the brain and meninges presented no pathological features whatsoever.

For microscopic study blocks were taken from the motor cortex, calcarine cortex, corpus striatum, cerebellar cortex and dentate nucleus, cervical cord, pons, and medulla. Sections were stained with hematoxylin-eosin, cresylechtviolett, Van Heuman's modification of the Weigert stain, phosphotungstic acid-eosin, and Sharlach R.

S.S.

PLATE I. ×100. Photomicrograph showing small fresh petechial hemorrhages into medulla near dorso-medial aspect of the restiform body.

High Cervical Cord.—The microscopic sections presented few, if any, pathological features. By the hematoxylin-eosin stain no hemorrhages or cellular infiltrations were seen. By the cresylechtviolett stain there was a mild degree of chromatolysis. Nuclei were slightly swollen. By the Van Heuman stain no tract degenerations were seen.

Medulla.—Sections stained with hematoxylin-eosin presented a small area of petechial hemorrhages near the dorsal and medial aspect of the restiform body. (Plate I.) No areas of leucocytic infiltration were seen. By the cresylechtviolett stain the nerve cells presented alterations similar to those of the cervical cord. By the Van Heuman stain there were no tract degenerations.

Pons.—Sections of the pons stained with hematoxylin-eosin were

free from hemorrhages or cell infiltrations. By the cresylechtviolett stain the nerve cells showed markedly swollen nuclei and moderate chromatolysis. Marked chromatolysis of the cells of the sixth nerve, nuclei had disappeared and the cytoplasm stained palely. (Plate II.) Marked neuronophagia was apparent in about one-third of the cells of the pons. (Plate III.)

Cerebellum.—By the cresylechtviolett stain the Purkinje cell nuclei were swollen and moderate chromatolysis was apparent. Cells of the dentate nucleus presented swollen nuclei.

PLATE II. ×400. Photomicrograph of the nucleus of the sixth nerve showing chromatolysis, swelling and eccentricity of the cell nuclei and complete destruction of some cells.

Upper Edge of Red Nucleus.—Sections at this level, stained by hematoxylin-eosin, showed no hemorrhage or cell infiltration. By the cresylechtviolett stain the cells showed moderate chromatolysis and neuronophagia was present around one-third of the cells. There were no apparent glial fiber proliferations by the phosphotungstic acid-eosin stain. By Van Heuman's stain no tract degeneration was seen.

Corpus Striatum.—By the hematoxylin-eosin stain no hemorrhages or infiltrations with leucocytes were seen. By the cresylechtviolett stain moderate chromatolysis was noted. The nuclei were swollen and eccentric. These changes were seen in the large and small cells of the pallidum. Neuronophagia was very definite in about one-third of the

cells. By the Sharlach R. stain droplets of fat were seen in the large cells of the pallidum. Fat was also seen in some of the small pallidal cells and in some perivascular spaces. There was no apparent glia fibril proliferation by the phosphotungstic acid-eosin stain.

Lateral Nucleus of Thalamus.—Sections stained with hematoxylin-eosin showed no hemorrhages or cell infiltration. By the cresylecht-violett stain the cells showed moderate chromatolysis and swelling of the nuclei. The nuclei were eccentrically placed and neuronophagia

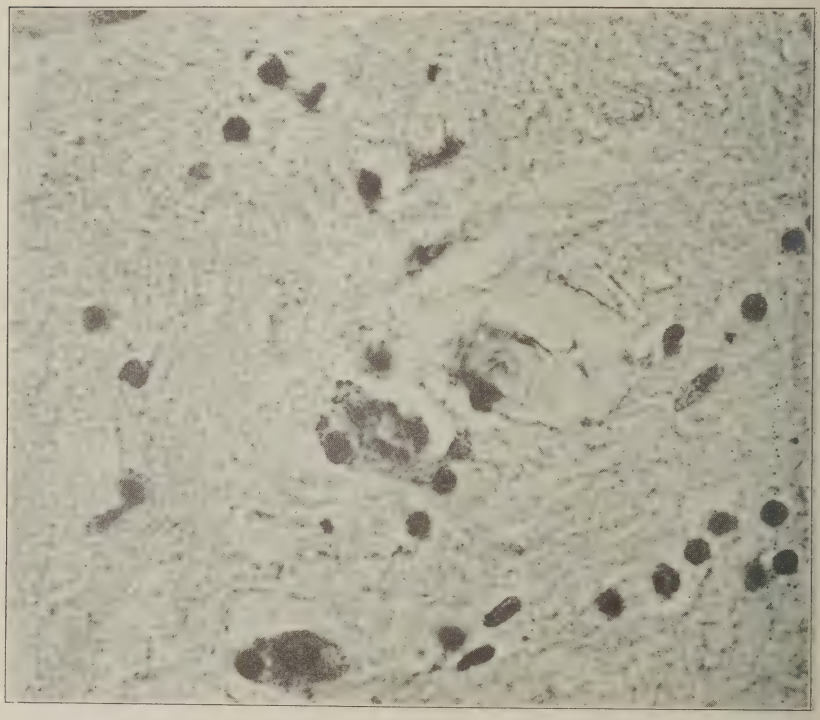


PLATE III. ×800. Photomicrograph of the pallidum showing neuronophagia, swollen and eccentrically placed nuclei. Some of the large cells and perivascular spaces show fat when stained with Sharlach R.

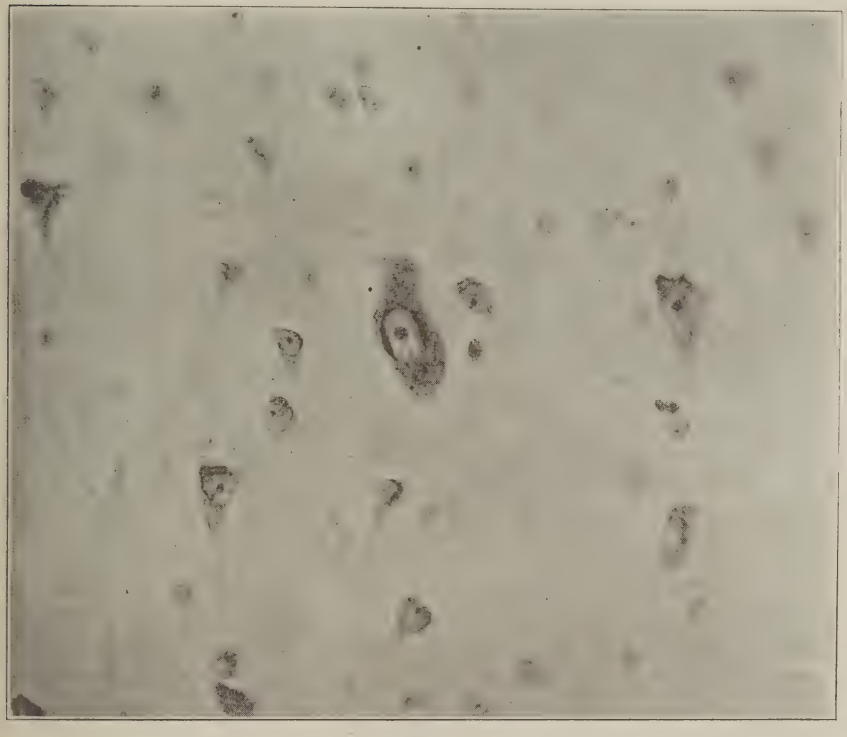
was seen in about one-third of the cells. By the Van Heuman stain no tract degenerations were seen. Sections stained with phosphotungstic acid-eosin showed no proliferation of glia fibrils.

Motor and Calcarine Cortex.—By the hematoxylin-eosin stain no hemorrhages or cellular infiltrations were seen. By the cresylechtviolett stain all cell layers of the motor cortex showed markedly swollen nuclei and much chromatolysis. Neuronophagia was seen in about one-third of the cells. By the Sharlach R. stain some of the cells, chiefly of the sixth layer of the motor cortex, contained fat droplets and some

of the perivascular spaces contained fat. The calcarine cortex by the Sharlach R. stain showed marked destruction of neurons in all layers with much chromatolysis in those that remained. The glia nuclei were greatly proliferated and fat was seen in some perivascular spaces.

Discussion

The outstanding findings in nerve cells were chromatolysis, swelling and eccentric location of nuclei, complete destruction of some



S.S.

Plate IV. ×400. Photomicrograph of motor cortex showing swelling of nuclei, chromatolysis and neuronophagia. When stained with Sharlach R. some of the cells of layer six and perivascular spaces show fat granules.

cells (especially the sixth nerve nuclei and neurons of calcarine cortex), neuronophagia, deposit of fat droplets in the cytoplasm of nerve cells and in some of the perivascular spaces, and a few small hemorrhages into the medulla near the restiform body. The glia cells were proliferated especially in the calcarine cortex. The swelling of the cell nuclei and chromatolysis and even the destruction of cells with deposits of fat within them might be explained as post-

mortem changes. The perivascular fat, hemorrhages into the medulla, neuronphagia, and proliferation of glia cells, must be explained otherwise.

Since Sydenham's original description of chorea minor the etiology and pathology have been variously explained. The relationship of chorea to endocarditis and rheumatism has long been noted. Choreiform movements have also been observed in association with other diseases and the question has been raised as to whether Sydenham's chorea is a disease or a symptom. It is sometimes seen in pregnancy or the puerperium. It has been seen in the course of gastrointestinal diseases.(1) It has occurred with exophthalmic goiter.(2) It has been observed in cases of polycythemia.(3) The differential diagnosis between acute epidemic encephalitis and Sydenham's chorea has been puzzling in not a few instances.(4) Choreic manifestations have been seen in individuals with proved thrombotic softenings in the basal ganglia.

The pathological findings in acute Sydenham's chorea have been so various that it may well be said there is no proved and definite lesion. Oppenheim (5) mentions reports of findings such as hyperemia of the brain, small hemorrhages into the brain, foci of softening and inflammation especially in the basal ganglia, disease of the blood vessels with thrombosis, inflammation of the cerebral membranes, occlusion of smaller vessels and capillaries with emboli (especially in basal ganglia), sinus thrombosis, cell infiltration of motor cortex, encephalitic processes, colloid corpuscles, changes in cerebellum and superior cerebellar peduncles. At least in some instances such reports doubtless represent the pathology of coexisting complications or associated diseases. Osler (6) said in 1911, "Endocarditis is by far the most frequent lesion in Sydenham's chorea."

Wilson,(7) by his extensive studies on the anatomy and physiology of the basal ganglia, has tended to focus attention on that portion of the brain as a seat of pathology in chorea.

Trétiakoff,(8) in 1919, reported the pathology of a case of acute chorea in which the basal ganglia were carefully examined. The case was severe and the patient died on the ninth day of the disease. Histologically the base of the brain showed a marked polioencephalitis. The cortex showed some inflammatory areas. The substantia nigra was involved with perivascular and parenchymatous infiltration. Nerve cells were swollen and edematous. There was neuronophagia and much increase in neuroglia.

Marie and Trétiakoff,(9) in 1920, reported the pathology of a case of acute infectious chorea, the patient dying on the tenth day of

her disease. The corpus striatum, thalamus, pons, and cortex showed lesions of an acute nature similar to those found in epidemic encephalitis.

Lewy, (10) in 1923, reported the pathology of eleven cases, one of which showed evidence of acute inflammation and bacterial emboli. He felt that the corpus striatum was not the only seat of involvement in Sydenham's chorea, but that the cortex was also involved. In some cases he found rather acute changes in the cells (chromatolysis) with fatty degeneration and a tendency to destruction of the cells. He found neuronophagia. He thought the degree of cell damage was in some degree comparable to the severity of the chorea. The neuronophagia was characteristic of the most acute process. He found much siderophilic material in the perivascular spaces in cases that had been ill a longer time. He thought that the small cells of the striate body were damaged more than the large cells. In the older cases rod cells were seen. He said that Spielmeier found similar acute changes in typhus patients sick only two weeks. In one case cell disintegration was found in the substantia nigra and body of Luys. In one case some infiltration of the pia of the cord was observed. In a case of chronic progressive chorea (not hereditary) the patient was observed for twelve years, during which time he had no symptoms of an acute infection. Such a case raised the question of factors other than infection in chorea. Lewy thought chorea was a manifestation of toxins on a brain that had poor resistance, especially in its motor elements.

Jakob (11) reported a case of chorea gravidarum in which there were areas of focal necrosis of varying age in the corpus striatum with marked glia proliferation.

From such reports one may gather that lesions in acute chorea vary from toxic cell changes to destructive lesions. The brains from cases dying of delirium, or exophthalmic goiter, or other severe toxemias may show changes similar to those of the case here reported. In these diseases, as in chorea, the patients may recover from the acute manifestations of the disease, which fact is in agreement with the type of pathology found in the case of acute Sydenham's chorea reported herewith. Only a relatively few cases of endocarditis or acute rheumatic fever have chorea. It is only occasionally associated with other diseases. These facts, together with a pathology that varies in degree from acute toxic changes in the brain cells to destructive lesions, give evidence of an individual factor. This factor may be a lowered resistance of the motor elements (motor cortex, corpus striatum) to toxins or infections, or

the elective action of toxins or infections on certain portions of the brain as in the case of progressive lenticular degeneration.(12)

Hunt,(13) in discussing the different syndromes of encephalitis, said that a lesion of the pallidum produced a paralysis agitans syndrome, while a lesion of the putamen and caudate produced a choreo-athetoid syndrome. Though he does not state definitely, it is presumed he refers to destructive lesions and with such lesions there are usually persistent residuals. The writer has observed a certain amount of awkwardness after recovery from the acute manifestations of Sydenham's chorea, which raises the question as to whether the motor system had ever developed properly and might thus be more amenable to toxic insults, or whether there were true residuals. These questions suggest room for much investigation.

Summary

1. The neuropathological findings in a case of acute Sydenham's chorea, with acute endocarditis, were chromatolysis of practically all cells of the central nervous system, with swelling of nuclei and eccentric displacement; destruction of some neurons, especially sixth nerve and calcarine cortex where glia cells were much proliferated; neuronophagia; fatty deposits in the large cells of the motor cortex and pallidum; fat in the perivascular spaces; and petechial hemorrhages in a small area near the dorso-medial aspect of the restiform body of the medulla.

2. Reports of pathological findings in acute Sydenham's chorea represent a wide variety of lesions, but recent work points especially to toxic changes in brain cells and to destructive lesions of the corpus striatum, some of which resemble the lesions of epidemic encephalitis.

3. In acute Sydenham's chorea some of the elements of the brain may be less resistant to toxins or infections, or the toxins or infections may have an elective action (irritating to destructive) on certain areas of the brain. Though the disease is recoverable, certain awkward tendencies observed in chorea patients after recovery make it apparent that the motor system has never developed properly, or that there are slight residuals.

Note: From the Department of Neuropathology of the Colorado Psychopathic Hospital and University of Colorado Medical School. The writer is indebted to Dr. Hugo Mella, Associate Professor of Neuropathology, for helpful suggestions.

REFERENCES

1. Oppenheim. Textbook of Nervous Diseases. Foulis, 1911.
2. Sutherland. Chorea and Graves' Disease. Brain, 1903, 26.
3. Pollock. A Case of Chorea and Erythremia. Jr. Amer. Med. Assn., 1922, 78, 725.
4. Alfaro. Epidemic Encephalitis and Chorea. Arch. Latino. Ann. Pediatri., Nov.–Dec., 1921, 546.
5. Ibid.
6. Osler. The Practice of Medicine, 7th Edition, 1912.
7. Wilson. The Anatomy and Physiology of the Corpus Striatum. Brain, 1914, 36.
8. Trétiakoff. Contribution a l'Étude de l'Anatomie Pathologique du Locus Niger de Soemmering. Paris, 1919.
9. Marie and Trétiakoff. Rev. Neurologique, 1920, 428.
10. Lewy. Die Histopathologie der Choreatischen Erkrankungen. Zeitschr. f. Gesamte Neur. and Psych., 1923, 85.
11. Jakob. Die Extra Pyramidalen Erkrankungen. Berlin, 1923.
12. Wilson. Progressive Lenticular Degeneration. Brain, 1912, 35, 296.
13. Hunt. Symptoms and Syndromes in Encephalitis. Amer. Jr. Med. Sci., 1921, 162, 481.

THE COLUMNAR ARRANGEMENT OF THE PRIMARY AFFERENT CENTERS IN THE BRAIN-STEM OF MAN *

By Walter Freeman, M.D.

SENIOR MEDICAL OFFICER, ST. ELIZABETHS HOSPITAL, WASHINGTON, D. C.

(Continued from page 170)

The cornea was carefully tested on each side. On the right side the finest hair produced smarting and stinging pain upon the least application. On the left cornea this hair (18 mg. bending strength, 9 grm./mm. tension) was distinctly felt every time it was applied, but it caused no pain. The same was true of hairs of bending strengths of 45, 60, 80, and 120 mg. bending strength, tensions of 10.8, 24, 43 and 66 grm./mm. respectively. The contacts of these hairs on the left cornea were accurately appreciated, yet no pain was produced. It was only when a hair of bending strength of 375 mg. (tension of 83 grm./mm.), was applied, that the patient experienced pain.

The inference is that the corneal fibers which apparently run wholly in the radix spinalis trigemini will also serve to transmit tactile stimuli when the mechanism for the transmission of pain is interfered with. It is possible however that the mechanism for the conveyance of pressure stimuli from the tunics of the eyeball is very highly developed, responding to the touches of delicate hairs. The cornea made analgesic with cocaine remains sensitive to light pressure. No satisfactory explanation of the phenomenon is known to me at the present time.

Pain. Pinprick about the mouth was felt equally readily on the two sides. There was diminution of sensibility to pinprick below the left eye and in the region of the temple, and on the forehead there was marked hypalgesia. The cornea was rather insensitive, and the corneal reflex diminished. Back of the hair line pain sensibility was diminished as far as the vertex.

Pressure. Pressure was felt everywhere, but pain was produced more readily on the right side. With Catell's algometer the following readings were obtained:

	Right	Left
Forehead	2 kg.	4 kg.
Cheek	2 "	3 "
Chin	3 "	3 "
Temple	3 "	5 "
Masseter	3 "	6 "

Pressure upon the eyeball produced pain equally readily on the two sides although there was no change in pulse rate in either case. Traction upon the hairs of the moustache or scalp was accompanied by pain on both sides, although on the left side slight displacements of the hairs of the moustache were not perceived. Similar displacements were felt on the right side. The patient was able to localize in a general way the region that was pressed upon although his incoördination made exact localization difficult for him. The vibration of a tuning fork was perceived on all bony parts although it was not perceived on the left cheek where no bony prominence was encountered. It was perceived on the right cheek.

Temperature. Small variations were named accurately in all parts except for a small area in front of the tragus (shaded in the photograph).

Mouth. The left side of the tongue on both dorsal and ventral surfaces was anesthetic to light touch. So also were the gums, cheek, hard palate and anterior pillars of the fauces. Objects placed in the left cheek (marble, cube, ring), were not recognized until the tongue tip was brought to them. Pinprick was painful equally on the two sides, and small differences of temperature were readily perceived.

Pressure was acutely felt on both halves of the tongue.

Motor division. The jaw deviated slightly to the left on opening the mouth and the patient experienced fatigue in mastication. The masseter and temporal muscles were noticeably smaller on the left side. No reaction to the faradic current was obtained from the left masseter muscle, and the masseter and temporal muscles reacted only to stronger galvanic currents than those on the right side. (5 M.A. left; 3.5 M.A. right.) As was noted above, pressure upon the masseter region was felt much less acutely on the left side than on the right.

VII. Touch. Light touch was immediately perceived over the inferior portion of the helix and lobe. The root of the helix and part of the tragus were insensitive to light touch on the left side. All other parts, including the anterior wall of the external auditory canal were normally sensitive.

Pain. Pinprick was everywhere perceived acutely in the neighborhood of the left ear.

Temperature. Warm and cold objects were sometimes confused when applied in front of the left tragus. In all other parts the sensation was immediately and correctly perceived.

Pressure. Deep pressure was everywhere recognized and well localized in the neighborhood of the left ear. Pain was produced by deep pressure equally on the two ears at less than 2 kg. The readings for pressure upon the facial muscles are given above.

Mouth. Light touch was not felt on the left side of the soft palate, the anterior pillar of the fauces and the tonsil. Pain was somewhat reduced in the same area and there was practically no reaction on the left side to stroking the soft palate. Taste was very much delayed on the

left side of the tongue in its anterior portion for all the solutions used, and absent for sweet. Quinine was perceived, with a certain element of parageusia.

Motor. There was very slight weakness of the facial musculature as expressed by diminished force of closure of the orbicularis palpebrarum and orbicularis oris. That it was not marked can be seen from the photograph. The stimulation by the galvanic and faradic currents showed slight but distinct hypoexcitability on the left side (left 6 M.A.; right 4 M.A.).

VIII. There was tinnitus on the left side with slight diminution in hearing. Air conduction was better than bone conduction. The Weber test was localized to the right. Caloric and galvanic tests for vestibular function showed diminished excitability on the left side, though this was not marked.

IX. Touch, pain, heat and cold, and pressure were accurately perceived in the mastoid regions of each side and in the external ear. Sensation in the pharynx was diminished but slightly to touch, and pinprick was readily felt. The gagging reflex was elicited slightly more readily by touching the right side of the pharynx. Sweet, sour, bitter and salty solutions were quickly perceived on both sides of the posterior portion of the tongue although there was some parageusia, sweet being called sweet but with bitter after-taste.

Motor. The patient complained of dysphagia especially for solids, and of regurgitation of liquids through the nose. Speech was somewhat nasal. During phonation the palate and uvula were elevated more completely on the right side. The gag reflex showed a definite curtain movement of the posterior wall of the pharynx to the right.

X. Sensation was normal in the distribution of the posterior auricular nerve. There was hypesthesia of the larynx and rima glottidis on the left side.

Motor. The patient was dysphonic. The left vocal cord was weak in movements of abduction. There were respiratory irregularities such as sighing, hiccough, etc., from time to time. The pulse averaged 85 with some irregularities.

XI. The power in the sternomastoid muscles was equal on the two sides and there was no atrophy. Elevation of the arms to the sides showed no suprascapular hollow, and the muscle mass of the trapezius was equal on the two sides.

XII. The tongue deviated slightly to the left on protrusion, but this was probably due to the deviation of the jaw. No atrophy could be determined; there were no fibrillary tremors. The left side of the tongue reacted to a weaker faradic current than the right side (left 117 mm.; right 112 mm.). Pressure was felt acutely on the two sides of the tongue, pain being produced equally on either half. The vibration of a tuning fork was felt on the right side but not on the left.

II C. Normal in all respects.

It seems that in this case we are dealing with two lesions, one in the medulla oblongata causing symptoms referable to the N. vagus and N. glossopharyngeus, and probably the N. facialis; and another situated more orally involving the Nucleus sensibilis and Nucleus motorius trigemini. Careful tests for various forms of sensibility carried out, upon the body and the extremities revealed no impairment at any other location than the face. As in Spiller's case we can say fairly certainly that the lesion involved the Nucleus sensibilis trigemini, both on account of the sensory disturbance and because of the fact that the masticatory muscles were markedly weakened on the left side. The motor and sensory nuclei of the fifth nerve are located in such close proximity that one could hardly be completely involved without the other also being affected.

As will be noted also, the hair sensibility was lost. This does not mean that pain could not be produced by traction upon the hairs of the moustache, but that the displacements that could be felt upon the right side were not perceived upon the left. Here we have an indication that the fibers supplying these hairs, which Head has shown to belong to the deep sensory system, travel in the sensory division of the trigeminus. It is the N. trigeminus that supplies the moustache hairs and Edinger (5) has shown a special development of the nucleus sensibilis trigemini in animals in which these hairs subserve an important exploratory purpose. This portion of deep sensibility, then, is rather a function of the N. trigeminus than of the N. facialis. That the radix spinalis trigemini is involved in its lower portion in the case reported is suggested by the relative analgesia over the forehead and cornea on the left side.

The "Radix Spinalis Trigemini"

The entering fibers of the posterior root of the Gasserian ganglion divide upon entering the pons. One division goes to the main sensory nucleus, the other turns caudad in the tractus spinalis trigemini.

It has been shown in a large number of observations that the spinal root of the N. trigeminus carries fibers for pain and temperature. If it carries touch fibers at all, they are not numerous, and of no practical import. The observation of Spiller (Case 2), and Case 3 here reported showing the inverse syringomyelic dissociation of sensation in the face, where only painful and thermic impressions could be appreciated, and where simple touch was not felt, would suggest that fibers for ordinary touch sensation do not run in the spinal root.

The evidence in regard to the grouping of pain and temperature fibers in the spinal root is derived chiefly from clinical sources, although among others (notably Wallenberg (62)) Gerard (50) has adduced some experimental evidence. She sectioned the spinal root in rabbits below the entry of the fifth nerve and tested the residual

sensation. In her experiments the sneeze reflex was taken as evidence of the integrity of general sensibility, and the corneal reflex for pain sensibility. The deep sensibility of the face could not be relied upon for information, because it was found that even after total transection of the posterior root of the Gasserian ganglion, stimulation with needle electrodes was followed by struggling and other manifestations of pain. This is in accord with the work of Davis. Transection of the radix spinalis trigemini was followed by loss of the corneal reflex, with preservation of the sneeze reflex. It is possible, however, or even probable that this test does not prove the point conclusively, for sensation from the interior of the nose is probably rather visceral than somatic. More convincing are the experiments of nature upon man, and the two principal conditions in which the root of the trigeminus is destroyed are occlusion of the posterior inferior cerebellar artery and syringobulbia. In both of these conditions pain and temperature sensibility are abolished over a more or less extensive territory on the face and head, whereas touch sensation is diminished very little, if at all. This proves conclusively that pain and temperature sensations are carried by fibers running in the descending spinal root of the trigeminal nerve. Gerard has collected a large number of cases.

This tract is so predominantly a product of the fifth nerve that other fibers entering into its composition are not generally considered. Marburg and others describe fibrae concomitantes of the tract that do not degenerate when the root of the fifth nerve is sectioned. He claims that these fibers are ascending in direction and consist of secondary paths. They apparently lie mesial to the root, are most numerous in the middle portion, and have a somewhat paler staining reaction, particularly in the immature brain. Aside from this however, Gerard, by actual count of the fibers in the radix spinalis trigemini, noted a relative increase in their number in the caudal portion of the tract. Also, as Cajal has shown, in the lower portion of the root a not inconsiderable portion of the fibers, a sixth to a seventh of the total number, come from the ninth and tenth nerves. They occupy the dorsal portion of the tract.

His illustrations are convincing in this regard (Fig. 19). He denies the existence of similar fibers from the facial nerve, but Kappers has shown that such fibers exist in the lower fishes and in the amphibia, and in the case of a three months' fetus where the spinal root of the trigeminus was darkened only a short distance below the entry of the fifth nerve, I was able to observe a portion of the entering fibers of the seventh nerve, blackened at their origin, enter this other-

wise pale tract. The evidence in preparations of older brains was unsatisfactory because in transverse sections it is impossible to be certain that fibers are really joining the tract. But in a careful comparison of the enteriing fibers of the N. facialis, with those of the N. glossopharyngeus, and N. vagus which are known to give fibers to this root, I could find locations of precisely similar aspect tending to show that a few fibers of the sensory division of the facial nerve turned caudally in the spinal tract, or as it deserves to be called the nociceptive division of the exteroceptive column. This would be in keeping with our original conception of the facial nerve as mixed nerve carrying cutaneous fibers.

The Segmental Representation in the Somatic Sensory Column and the Principle of Usurpation.

The entering root fibers which run caudally in the exteroceptive column, commonly known as the radix spinalis trigemini, take up definite positions with respect to one another in the root. This was shown long ago by the experiments of Bregmann who performed incomplete transection of the posterior root of the Gasserian ganglion. According to his findings (Winkler, Vol. 7, pp. 29 and 61), the mandibular nerve sends its fibers in the dorsal portion of the tract and the ophthalmic nerve into the ventral portion of the tract. These fibers do not all run caudally to the same level. A low section of the spinal root will abolish the corneal reflex in animals whereas the reflexes elicited by painful stimuli applied to the region about the mouth are fully preserved. More definite and characteristic results are obtained in the examination of patients suffering with cavitation of the substantia gelatinosa in cases of syringobulbia. The gradual progression of the disease may be traced by the extension of the analgesic area upon the face. This has been done by Dejerine, Brouwer, Head and others.

The analgesic zone in the neck is prolonged first up over the scalp, then in front of the ear and to the root of the nose, then narrowing gradually toward the mouth. This is indicated in the diagram taken from Dejerine (Fig. 3). He delimits five zones while Winkler considers only three, but the principle is the same.

As Brouwer (16, p. 275 ff.) has shown, it is not accurate to say that the fibers of the ophthalmic division run the farthest caudal and that those of the mandibular division end at superior levels.

There is an entire redistribution in the nervous axis, and fibers from each division end at each level. This is shown by a comparison of the areas subserved by the various divisions of the N. trigeminus

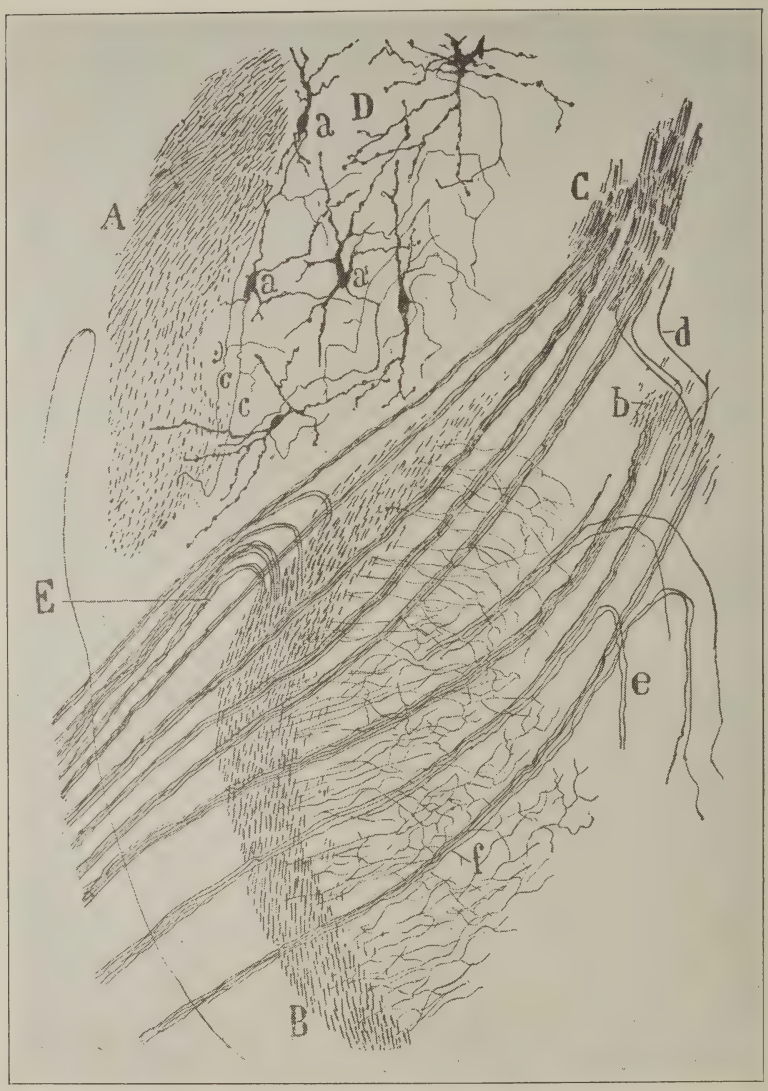


FIGURE 19. Medulla oblongata of fetal cat. (Cajal, Vol. II, Part 1, p. 67.) Some of the entering root fasciculi of the vago-glossopharyngeal complex joining the radix spinalis trigemini. A. Corpus restiforme. B. Descending portion of the trigeminus. C. Fasciculus solitarius. D. Vestibular nucleus. E. Trigeminal portion of the vagoglossopharyngeal. e. Motor fibers of the ninth and tenth running to the nucleus ambiguus.

(Fig. 2-a) with the line of advance of the sensory dissociation (Fig. 3).

The area above the ear which is supplied by the third division is among the first to become analgesic whereas the area about the tip of the nose which is supplied by the first division is among the last to become analgesic.

From the point of view of the sensory disturbances in syringobulbia there is very definite segmentation shown centering about the mouth. In this respect the segmentation may be likened to that which is found about the anal orifice. The two orifices are the original rostral and caudal ends of the body. The cutaneous surfaces surrounding the eyes have an innervation that is derived from a region farther caudad than the innervation for the region surrounding the mouth. This is shown even in the lower fishes.

The cutaneous area supplied by the N. trigeminus in the higher vertebrates is relatively much larger than that so supplied in the lower ones. In some fishes and in the amphibia the seventh and other nerves have a considerably larger cutaneous representation than we find to be the case in mammals.

How does it happen, then, that the fifth nerve has taken over the field which was originally innervated by segments further caudal?

The N. trigeminus has apparently encroached upon the cutaneous areas formerly supplied by the other cranial nerves, and even by the first cervical nerve which has lost its dorsal root. Winkler (14, Vol. 7, p. 1) regards the Gasserian ganglion as a "collection of spinal ganglions belonging to the segments from C 1 to the most proximal of those which are concerned in the innervation of the skin." The fusion of these ganglia has caused the N. trigeminus to preside over this greatly enlarged area and has led to the large representation of its fibers in the spinal root. This idea, however good it may be from the standpoint of function, is not borne out by anatomical findings. The only fusion that is known to have taken place with respect to the N. trigeminus is that between the ganglion of the ophthalmic nerve which is found in amphioxus and in the embryo, and the maxillomandibular ganglion, into the semilunar or Gasserian ganglion. Moreover the posterior root ganglia of the other nerves, although relatively reduced in size in comparison with that of the N. trigeminus, are to be found, and seem to have cutaneous fields, however small and poorly known they are.

We know how, during the course of a few months, the nerve fibers from the regions surrounding an anesthetic area (for instance in the face after trigeminal neurectomy), will encroach upon this area and reduce it considerably. Cushing (17) demonstrated this twenty years ago. The extension of the adjacent nerves has been

augmented, they have undergone compensatory hypertrophy in response to the demand for function, just as is the case with so many other organs.

In the long course of vertebrate development, the trigeminus has become predominant, its ganglion has undergone true numerical hypertrophy, not from migration of ganglion cells from the other ganglia, but due to unknown reasons, of which free blood supply from the neighboring carotid artery may play a part. Changes take place less readily in the central nervous system however. The systems as they are laid down in the lower vertebrates undergo only partial modification. Especially the primary centers and the secondary tracts shift their position but little. Hence it comes about, probably, that the origin of the secondary system of fibers remains in its primordial position, and the primary fibers, although they arise in a different ganglion must travel farther in their intramedullary course before they form connections with them. If we consider with Herrick (9, p. 197) that the spinal root of the N. trigeminus represents a phylogenetically old structure, that it is concerned with the transmission of impulses of pressure, pain and temperature, and that in its internal structure it has a strictly segmental arrangement, whereas the main sensory nucleus is of later origin and has to do more with the transmission of the discriminative forms of sensation, then the trigeminal nerve must have usurped the fields formerly supplied by other cranial nerves. This usurpation must begin very early in the vertebrate series, for the R. spinalis trigemini is already somewhat developed in the cyclostomes although its importance is increased in other fishes. The tract is well established long before the appearance of the main sensory nucleus which occurs only in the reptiles and higher classes. When this nucleus (and its homologous nuclei pertaining to other cranial nerves), is developed, it is concentrated in one place at the level of entry of the nerve, and receives the collaterals from the radicular fibers that then bend caudally in the spinal root.

There are certain structural differences between the upper and lower portions of the nucleus accompanying the radix spinalis trigemini. The upper portion shows greater resemblance to the base of the dorsal horn of the spinal cord, and the lower portion a construction more like that of the substantia gelatinosa proper. In speaking of the spinal cord Winkler attributes to the base of the dorsal horn the interoceptive sensations together with temperatuve sensations. Pain and thermic impulses are sometimes dissociated in spinal lesions, and quite frequently in lesions of the radix spinalis trigemini, *e.g.* Cases 2 and 3. Whether the nucleus described by Winkler, situated

in the middle portion of the tract, receives and transmits thermic stimuli, and the nucleus gelatinosus the painful impressions is not certain, but is suggested as a possibility.

In summary, then, the cutaneous sensory fibers, those of the exteroceptive system, enter the brain-stem chiefly by the sensory root of the N. trigeminus, but also by the sensory divisions of the seventh, ninth and tenth nerves. They divide upon entering, one portion running to an interrupted column of large cells of the type seen in the nuclei of the dorsal funiculi. Representatives of this column are the nucleus sensibilis trigemini and the small exteroceptive nuclei of the seventh, ninth, and tenth nerves. The other portion runs caudally to varying levels in the nociceptive division of the exteroceptive column, commonly called the tractus or radix spinalis trigemini. In this column the segmental arrangement of the origin of the secondary tracts has remained, as is shown by studies of the advance of the analgesic area in cases of syringobulbia. The segmentation about the oral end of the body is shown to center about the mouth. In the course of development the N. trigeminus has encroached upon the fields supplied by the other nerves, but because there has been no shift in the primary receiving centers for these pain fibers, the communications of the cells of the Gasserian ganglion with the cells of origin of the bulbothalamic tract must be established by a prolongation of the axones of the cells of the Gasserian ganglion; and this gives rise to the so-called spinal root of the trigeminal nerve.

B. *The Interoceptive Column*

The interoceptive or visceral sensory column is represented by the tractus solitarius with its attendant nuclei. This tract is made up of some large fibers and of a great number of fibers having only very thin myelin sheaths or none at all. It is very early in development, and in sections from the brain-stem of a three months' human fetus impregnated with silver, it is by far the most prominent tract in this part of the nervous system. It is most noticeable from the level of entry of the N. glossopharyngeus to the point where the fourth ventricle closes to form the central canal. Here is situated a nucleus of small cells, the nucleus commissuralis, described first by Cajal (2, p. 733), and there is good physiological evidence (see Pike and Coombs, Science, 1923), to show that this constitutes the true respiratory center of the bulb.

Examining the tractus solitarius from the standpoint of the column, we find that it occupies the portion of the medulla oblongata that corresponds to the pars intermedia, the interoceptive column of

the spinal cord. It is indeed a direct continuation of this column into the brain-stem (Fig. 20). From the lower end of the fourth ventricle as far as the nucleus of the fifth nerve, the interoceptive column can be traced in serial sections. Boettiger remarked this long cephalic prolongation though Van Gehuchten denied it.

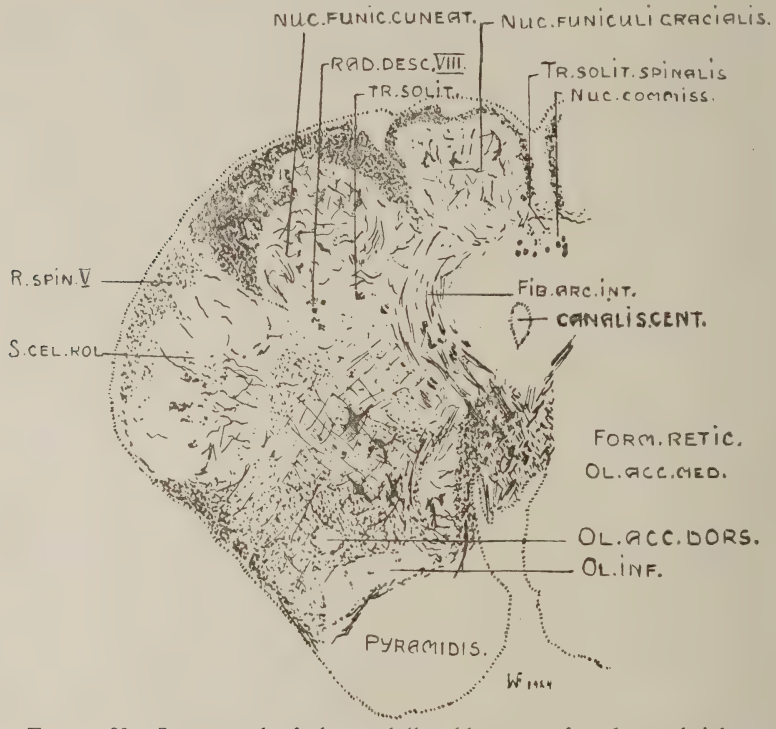


FIGURE 20. Lower end of the medulla oblongata of a 6 months' human fetus (silver impregnation). The nuclei of Goll and Burdach are beginning to send out the internal arcuate fibers to form the lemniscus medialis. There is still a part of the dorsal funiculi remaining. The large pale area situated laterally is the substantia gelatinosa Rolandi lying within the lower end of the radix spinalis trigemini. The lower end of the inferior olive is to be seen, bordered by its medial and dorsal accessory bodies. In the dorsal portion of the central gray matter, dorsal to the canalis centralis is the lower end of the nucleus commissuralis represented by a few cells. The caudal extension of the tractus solitarius is to be seen external to the fibrae acruatae internae, and immediately to the outer side of this lies the radix descendens N. VIII. They have come to occupy the positions of the pars intermedia and Clarke's column in the spinal cord.

As far up as the level of the IX nerve it stands out prominently. At this point it lies at the dorsomesial angle of the descending root of the VIII nerve, and in this same position we find it at the level of entry of the sensory root of the facial nerve. It is clearly distinguishable as far proximal as the level of the nucleus sensibilis

trigemini, and loses itself in the triangle between this nucleus and the radix mesencephalica trigemini (Fig. 12). It undergoes alterations in size and shape, its appearance is changed by the advent of the gustatory nuclei, but its continuity and constancy are outstanding peculiarities.

The interoceptive column, of which the tractus solitarius is the most prominent part, receives fibers from all the mixed nerves of the brain-stem. From the N. trigeminus come fibers supplying the bucconasal mucosa, and the orbit (Winkler, Vol. 7, p. 61). From the seventh nerve come fibers supplying the middle ear, eustachian tube, and palate with general visceral sensation, and the anterior two-thirds of the tongue with special gustatory sensation. From the ninth nerve come fibers supplying the pharynx and middle ear with general visceral sensation and the posterior third of the tongue and the pharynx with gustatory sensibility. From the vagus come fibers supplying the rest of the alimentary canal and its appendages, the respiratory system and the cardiovascular system with general visceral sensibility, and the region of the epiglottis and larynx with gustatory sensation. The vagus component is so large that it brings the column into great prominence, and the multiplicity of nuclei occurring in the lower bulbar portion of the column point to its great importance.

The nucleus accompanying the tractus solitarius and subserving common visceral sensation is continuous. It consists of small cells fairly closely grouped, separated, however, by a fine meshwork of fine fibers, and in its supravagal portion it is covered on the dorsolateral surface by a crescentic mass of fibers of fine caliber that are derived from the most dorsal portion of the entering afferent nerve roots. These roots run to the column fairly direct from the point where they penetrate the marginal neuroglia layer. A part of them penetrate the nucleus from its ventral aspect; most, however, go to make up the overlying crescentic bundle of fibers that is found cut transversely in frontal sections. Not all of these fibers run far caudally, however. The band becomes noticeably diminished between the fifth and the seventh nerves, and again between the seventh and the ninth, where in preparations from the adult brain-stem it almost disappears. From experimental investigations (Van Gehuchten, 65), and according to Cajal, it would appear that fibers from the N. vagus are the only ones represented at the level of the nucleus commissuralis.

Cajal (2, p. 733) describes two nuclei accompanying the solitary tract, a small one situated externally, the cells of which are also found among the fibers, which Cajal calls the nucleus interstitialis. This is apparently not the ventral nucleus described by v. Monakow and

others, of which Cajal here makes no mention (I have already given reasons for believing that this nucleus belongs to the exteroceptive system). Situated on the inner side is a large nucleus which Cajal calls the ganglion descendens. The tract gives a small number of fibers to the nucleus interstitialis, and a large number to the ganglion descendens. The nucleus commissuralis is formed by the fusion of these two latter ganglia in the midline at the lower angle of the fourth ventricle. The fibers running to it are best seen in fibrillar preparations for they have very thin myelin sheaths or are wholly unmyelinated. Where the ganglia descendentia of the two sides come together to form nucleus commissuralis, a large portion of the fibers of the tractus solitarius cross to the opposite side in the decussatio infima. This is well developed even in the fetus of three months. A small part of the fibers, as Cajal further notes and as I have been able to confirm, continue uncrossed to lower levels, as far as the pyramidal decussation. "And when the Nucleus cuneatus disappears, the tract can be seen penetrating the internal portion of the base of the dorsal horn of the spinal cord, that is to say, in the region of the posterior commissure" (Cajal, 2, p. 733). (See also Fig. 20.) This column then is the cephalic continuation of the pars intermedia of the dorsal horn, or better, the interoceptive column.

Two other nuclei situated in the interoceptive column are deserving of special description, the collections of cells existing at the level of entry of the seventh and ninth nerves. At the level where the motor root of the facial nerve penetrates the corpus trapezoides and the formatio reticularis grisea, a number of filaments of the sensory root are seen penetrating the substantia gelatinosa of the radix spinalis trigemini, converging on the interoceptive column which lies just to the inner side of the descending root of the octavus (Fig. 8). Here the dorsal divisions of the sensory root come into relation with a fairly large rounded gelatinous mass, almost without fibrils, and containing a few small rather widely scattered cells. Dorsal to this is a triangular more compact collection of small cells which also receives fibers from the dorsal divisions. The gelatinous nucleus disappears a few sections in each direction, but the smaller triangular or oval nucleus of compactly arranged small cells remains constantly in relation with this upper end of the tractus solitarius proper. The Nucleus gustativus described by Nageotte (31) appears to have extended over a much larger area.

Where the glossopharyngeus nerve enters in two divisions of about equal size, the lateral root encounters a pyriform gelatinous nucleus with scattered small cells before it reaches the more dorsally situated

tractus solitarius with its attendant compact small-celled nucleus (Fig. 9). The gelatinous nucleus is encountered only in this vicinity. These nuclei are relatively considerably larger in the fetus than they appear in the adult.

No structure of sufficiently notable similarity was encountered in connection with the vagus nerve. The reasons for believing these gelatinous nuclei to be the gustatory nuclei are several. In the first place they are situated in the viscerosensory column, and the taste-buds, as Johnston (8) has shown, are derived from the entoderm and not from the ectoderm. Secondly, these somewhat peculiar nuclei are found only at the level where the principal nerves of taste arrive at the specified column. The negative side of the question is considered somewhat in detail by Kappers (43, 44) from the standpoint of comparative anatomy.

The tractus solitarius, which in the past has been considered by many anatomists to convey gustatory impressions, is practically undeveloped in the cyprinoid fishes. In these fishes the taste-buds are distributed not only in the mouth, but over the head, the fins, and even a large part of the body. The seventh and tenth nerves are very large. The large collections of gray matter at the level of entry of these nerves are so prominent that they are called the vagal or facial lobes. It seems probable that these structures have to do with the relay of gustatory impressions.

The tractus solitarius as such first becomes noticeable in amphibia, that is, with the change from gill breathing to lung breathing, and it increases progressively through the vertebrate series. In birds it is developed to a great degree, whereas the gustatory sense in birds appears to be only rudimentary. Kappers compares the tractus solitarius of the cassowary with that of the rabbit. The bird has probably less than one hundred taste-buds altogether, while the rabbit has 17,000. The tractus solitarius of the cassowary is as large if not larger than that of the rabbit. Finally a comparison of the number of fibers supplied to the tractus solitarius by the several nerves, and their known relation to the sense of taste of these nerves, shows that the smallest number is supplied by the N. facialis and the largest number by the N. vagus, whereas the gustatory representation in the nerves is the exact reverse. In truth we may well agree with Kappers (I, p. 311) when he states that of all the IX and X fibers, those in the tractus solitarius have least to do with taste. The tractus solitarius probably transmits stimuli that provoke the reflexes connected with air breathing, and it is composed of fibers transmitting impulses of general visceral sensibility, chiefly from the upper respiratory pas-

sages. According to Kappers this tract well merits the name formerly applied to it of fasciculus respiratorius.

To sum up, then, the interoceptive column is practically continuous from the base of the dorsal horn of the spinal cord to the area lying dorsomesial to the nucleus sensibilis trigemini. It receives fibers from all the mixed nerves, being in relation with the lateral roots of the entering nerves. It is developed very early in fetal life. Its most prominent part, the tractus solitarius, conveys not gustatory but general visceral sensation. It forms the afferent path for impulses from the respiratory passages that bring about the reflex acts concerned in the breathing of air. The special interoceptive component fibers of taste find their nuclei in this column at the level of entry of the seventh and ninth nerves. No Nuc. gustativus N. X could be identified.

C. *The Proprioceptive Column*

The proprioceptive system is no less complicated than the other afferent systems. From the functional point of view there are two main rôles that it plays. The first is to inform our centers of consciousness of the location in space of the various segments of our body, so that we are able to form what Head has called a schema of our relations in space. This might be called the cognitive function and enables us to perform that complex act of the recognition of the form of objects through the sense of touch, in other words stereognosis. The other part played by the proprioceptive system has to do with the maintenance of equilibrium and the adjustment of tonus, and is carried out automatically, through the mediation of the cerebellum. The end-organs of the proprioceptive system are situated chiefly in the muscles and tendons. The afferent fibers apparently run by way of the motor nerves and find their ganglion cells in the dorsal spinal ganglia and the corresponding cranial ganglia. In the substance of the cord there is a redistribution of these impulses, one element being shunted to the automatic proprioceptive centers which are strictly segmental, and find their expression in the cells of the column of Clarke. The fibers subserving the cognitive function run cephalad in the dorsal funiculi to end in the nuclei of Goll and Burdach. The latter is the more recently developed system in the phylogenetic series.

The close relationship of the proprioceptive cognitive and the exteroceptive discriminative systems is apparent at a glance, and what I have said concerning the exteroceptive discriminative system applies equally to the proprioceptive cognitive system. The same nuclear systems subserve both functions, therefore this latter one will be discussed only incidentally in the sections below. We have found

the centers subserving the cognitive function in the brain-stem. They are the main sensory nuclei of the various cranial nerves and have already been described. As was shown, these nuclei form an interrupted column of cells comprising the nucleus funiculi cuneati, the nucleus sensibilis trigemini, and the smaller intermediate nuclei. The secondary pathway is found in the lemniscus medialis.

The proprioceptive system as expressed in the spinal cord by the column of Clarke has not yet been accounted for in the brain-stem. There is physiologic evidence strongly indicating the automatic control of tonus in the muscles supplied by the cranial nerves. Such control is obviously needed and exercised, for example, in carrying out the function of speech, of eating, and of facial expression. Moreover, these functions are disturbed to some extent in cases of disease of the cerebellum which tend also to disturb the maintenance of equilibrium. What is the connection therefore between the cranial nerves and the cerebellum?

Many years ago Edinger (5) described a bundle of fibers entering the brain-stem with the afferent divisions of the cranial nerves, particularly the N. trigeminus, and running directly to the cerebellum, the direct sensory cerebellar tract. This appeared evident because in the immature brain such fibers were myelinated at an early date. Comparative studies have shown direct afferent fibers entering the cerebellum in fishes, and here they form an important component of the various nerves. There is also some experimental evidence of the existence of such fibers in mammalia. Winkler among others, in a few rabbits in whom he had sectioned the posterior root of the Gasserian ganglion, described a few degenerated fibers running toward the cerebellum. These findings were confirmed by some observers and disputed by many others, until finally Winkler (14, Vol. 7, p. 41) is much in doubt as to the existence of such a tract, and Edinger (5, p. 230) himself has retreated from his original stand and states as his opinion that these fibers are efferent ones from the tectile nuclei.

In serial sections impregnated with silver from the brain-stem of the human fetus, three, four, and six months of age, I have been able to find no convincing proof of the existence of entering root fasciculi running directly to the cerebellum. The evidence was not conclusively negative, however, and in some sections there was an appearance of fibers running towards the cerebellum (Figs. 8 and 9). As I have shown, however, the sensory nuclei situated at the tip of the corpus restiforme lay in their path, and these may have been their destination. On the whole there is no convincing evidence of a direct sensory cerebellar pathway from the cranial nerves. Leaving aside

the question of the cerebellar connection of the ordinary mixed nerves for the moment, we take up the consideration of the great proprioceptive system of the medulla oblongata, the labyrinthine system.

I. *The Octavus System*

The nervus acusticus occupies a rather special position among the cranial nerves. It is an unmixed sensory nerve (excepting some efferent autonomic fibers said by Winkler to come from Bechterew's nucleus), resembling in this regard the optic and olfactory systems. Unlike them, however, it does not arise directly from the neural tube as an individual system. The ganglia of the eighth nerve are derived, according to the very careful work of Adelman (21a), from the neural crest. Another peculiarity of the octavus system is its place in the functional scale. In its origin it is derived from the cutaneous system, and Johnston (8) considers it under the special cutaneous afferent system. On the other hand, Winkler (14, Vol. 7) ascribes to it a proprioceptive function of very great importance. Tilney (13) settles the difficulty by remarking that there need be no hesitancy in accepting its proprioceptive function if we remember that its end-organs are derived from the ectoderm instead of from the mesoderm, as is the case of the other proprioceptive end-organs.

It seems probable that by an analysis of its anatomy and physiology we may be able to place the eighth nerve in relation with the other nerves of the brain-stem instead of in a category by itself. There are certain similarities that persist in spite of the great differences.

To begin with, the octavus system is in reality double, the cochlear system subserving the function of hearing, and the vestibular portion subserving the function of equilibration. The divisions enter the medulla oblongata separately and for the most part find different end-stations. In this paper the terminations can only be indicated. I follow Winkler in the following description, for he has employed experimental methods. By strict anatomical methods the paths cannot be definitely determined.

The vestibular division enters the medulla oblongata mesial and slightly proximal to the cochlear division. It traverses the zone between the corpus restiforme and the radix spinalis trigemini and attains the nucleus triangularis or nucleus dorsalis N. acustici. The root zone is indicated in Fig. 16. The nucleus is situated close to the lateral angle of the fourth ventricle and extends a considerable distance both proximally and distally. Many of the fibers of the vestibular nerve bend caudally and run in the tractus descendens nervi octavi, to connect with cells in the nucleus tractus descendentis. Other

fibers run in the tractus ascendens nervi octavi, although Winkler suggests that these are probably efferent fibers from Bechterew's nucleus.

The cochlear division enters laterally and distally with respect to the vestibular division, and its fibers end in:

(a) The nucleus ventralis nervi acustici;

(b) The tuberculum acusticum;

(c) The lateral portion of the nucleus triangularis;

(d) The nucleus corporis trapezoidis.

The last two nuclei are supposed to receive fibers from the macula sacculi which travel with the cochlear nerve but seem to belong rather to the vestibular system. The fibers from the organ of Corti, prolongations of cells in the ganglion spirale, probably end almost entirely in the tuberculum acusticum and in the nucleus ventralis nervi acustici.

Developmental studies also show differences in the behavior of the two divisions. The cochlea is formed considerably later in the vertebrate series than the semicircular canals and otolith organs.

The cochlear nerve becomes myelinated at a later date than the vestibular nerve. In my silver preparations of a three months' human fetus, the vestibular nerve is well stained, whereas the cochlear nerve is discernible with difficulty and its reception nuclei are indistinguishable. Johnston (8) states: "Two important things are to be noticed in regard to the centers for the cochlear division. The first is that these nuclei are superficial with respect to the vestibular nuclei. In this they offer a clear illustration of the general law that the more highly specialized structures of the brain, and hence those which have appeared later in the phylogeny, are placed toward the outer surface with respect to the older structures to which they are related. The second point is that no cochlear fibers run to the cerebellum."

The ventral nucleus of the cochlear nerve and the tuberculum acusticum are situated ventrally with regard to the other tegmental structures if considered in the transverse plane of section, yet taking the floor of the fourth ventricle as the basis of judgment, these centers are found to lie directly beneath the ependyma. The great expansion of this portion of the medulla oblongata has caused an extension of the floor of the fourth ventricle far out into the lateral recesses, and the floor has actually curved around the outer border of the medulla oblongata as far as its lateral aspect. The relationship, which is clear in the fetus (Fig. 21), is somewhat obscured in the adult nervous system. The cerebellum comes in contact with the lateral surface of the medulla, and much of this surface which was originally the floor of the fourth ventricle becomes obliterated by the fusion of the two

masses. In the adult brain-stem only a small part of the tuberculum acusticum can be seen in the floor of the fourth ventricle, while in the embryo, even as late as six months, almost the whole of it, and the Nucleus ventralis acustici as well, are found beneath the lateral part of the floor of the fourth ventricle. Fig. 21 shows how the development of the whole proprioceptive system at the level of entry of the N. octavus has caused the proprioceptive centers to spread in mushroom fashion over both the interoceptive and the exteroceptive reception nuclei.

The position of the acoustic nuclei in relation to the vestibular nuclei corresponds more with the location of the nuclei of the proprioceptive cognitive system. Differentiation has proceeded to a considerable degree, but many points of resemblance remain. For instance, it may be called to mind that the secondary projection fibers running from the acustic nuclei in the lateral fillet are in close approximation with the secondary fibers of the common proprioceptive cognitive system, namely, the lemniscus medialis.

The vestibular division was described as ending in the nucleus triangularis and the nucleus descendens, possibly also in the nucleus of Bechterew, although this nucleus may be the source of efferent fibers.

In tracing the development of the vestibular system we find it everywhere represented in vertebrates. Amphioxus apparently possesses neither labyrinth nor lateral line system, but in the cyclostome fishes the semicircular canals are already developed and are served by the eighth nerve. There are also lateral line organs which are served by branches from the V, VII, and IX or X nerves. The lateral line system is found in all fishes and in the aquatic amphibia, but undergoes involution in the transition from marine to terrestrial existence. There is very clear evidence that the lateral line system is the forerunner and homologue of the labyrinth. The lateral lines of fishes contain sense organs like those of the labyrinth, responding to vibration and probably to differential pressure, and impressions from these are relayed to the brain-stem. The reception nuclei are located in the lobus lineae lateralis (Fig. 1), and the area acustica (not homologous with the tuberculum acusticum of man), although many entering root fibers run directly to the cerebellum. Some of these original cerebellar afferent fibers still exist in the eighth nerve.

In the change from aquatic to terrestrial life the lateral line system of organs is lost, and the function of equilibration comes to be carried on by the labyrinth. With this change and the suppression of the lateral line system goes a progressive increase in the size and impor-

tance of the labyrinth. The origin of the octavus system, however, is probably to be found in the simple lateral lines of ancestral fishes, subserved by the three nerves mentioned. The nerves supplying the

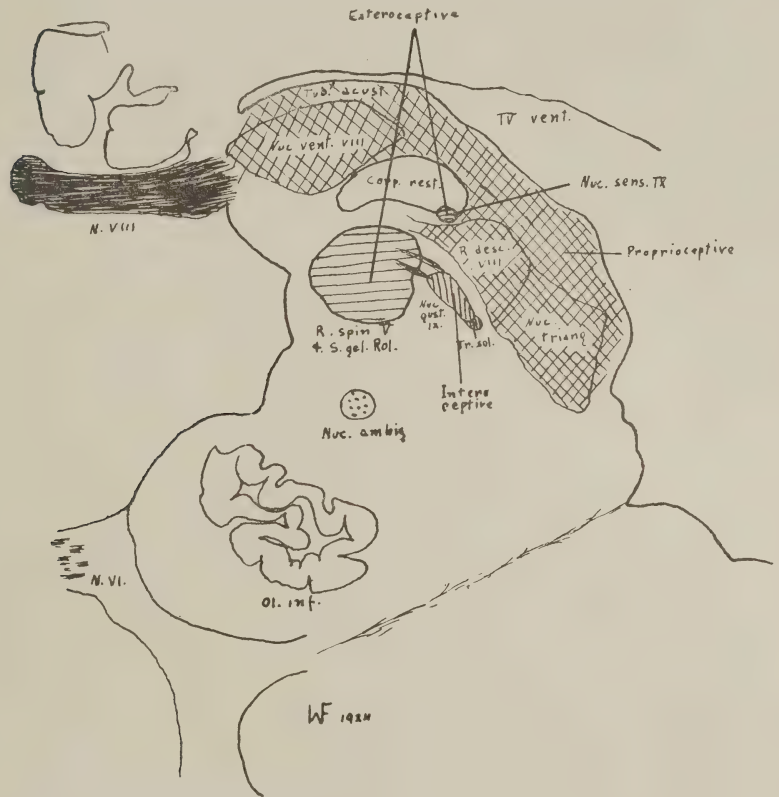


FIGURE 21. Semischematic diagram showing the relation of the nuclei of the octavus system and their incorporation into the columnar architecture of the brain-stem. The acoustic nerve is shown coming into relation with the tuberculum acusticum and the nucleus ventralis nervi cochlearis. These nuclei lie laterally in the floor of the fourth ventricle which is not yet obliterated by the cerebellum. The great development of the proprioceptive system as represented by these nuclei and by the nucleus triangularis and nucleus radicis descendentis vestibuli has displaced the other primary afferent systems ventrally. The radicular fibers of the Nervus IX are seen penetrating the R. spinalis trigemini and encountering the nucleus gustativus IX and the tractus solitarius. The motor components are represented by the nucleus ambiguus superior, and the radicular fibers of the Nervus abducens. The section has been rotated to conform with the others.

lateral line organs follow the course of the nerves carrying general cutaneous sensibility and are regarded by Johnston as mere specialized portions of these nerves.

From embryological investigations we learn that the ganglia of

the eighth nerve are developed directly from the neural crest. In the human embryo, according to the researches and model of Minot (Johnston, p. 41), and the recent careful work of Adelman (21a) on the rat, and of Bartelmez and Evans (21b) on man, the ganglia for the seventh and eighth nerves arise from a single mass, the ganglion acusticum-faciale.

This evidence still further suggests that *the eighth nerve is not a separate and distinct nerve from the beginning, but rather a highly specialized portion of the seventh nerve.* This would serve to explain their constantly close relationship, and would also fit in with the conception of the fundamental architecture of the brain-stem.

Pursuing this idea, we find the cochlear portion behaving like the proprioceptive cognitive division of the somatic sensory system, and the vestibular portion behaving like the proprioceptive automatic postural division. They are both proprioceptive in nature because the end-organs of the octavus system are stimulated not directly by external impressions but by the alterations of pressure, flow, etc., of the fluid that bathes them or by the displacements of the otoliths.

The location of the nucleus triangularis acustici in the brain-stem is between the exteroceptive and the interoceptive columns. The radicular fibers of the N. vestibularis course caudally in the tractus descendens nervi vestibuli lie between the nucleus funiculi cuneati and the tractus solitarius (Fig. 17), and the peculiar assembling of the fibers into small compact bundles separated by cellular areas renders it possible to follow the tract down to the level of the pyramidal decussation (Fig. 20). In this position the fibers lie close to the base of the posterior horn but external to the position occupied by the caudal extension of the tractus solitarius. In other words, the descending root of the eighth nerve is continous and homologous with the column of Clarke. The great expansion of the column that takes place in the medulla oblongata is due to the large octavus component which comes to it. The proprioceptive centers then spread mushroom-like over the other primary afferent centers (Fig. 21). The cells in the nucleus proprius tractus descendentis N. VIII send fibers to the vermis cerebelli in the same way that the cells of Clarke's column do.

The explanation of the long course distally in the medulla oblongata is again to be found in the principle of usurpation. The impulses subserving equilibration originally came to the medulla by way of several nerves but subsequently became concentrated in one nerve. The concentration in one nerve, however, has left unchanged the original internal distribution of the cells of origin of the secondary pathway.

If the radix descendens octavi is considered to be the homologue of the column of Clarke, does it show still further resemblances in receiving fibers from more nerves than the acusticus alone? Does it fulfill this test of being the reflex proprioceptive column for all the mixed nerves of the brain-stem?

Up to the present time I believe that the radix descendens nervi vestibuli has been considered to be a pure product of the eighth nerve, but such appears to me not to be the case. In its course caudad the radix descendens lies in close approximation with the upper portion of the tractus solitarius, and the root entering nerves, the seventh,

FIGURE 22. Oblique section of the medulla oblongata of a three months' fetus, showing the entering fibers of the N. vagus running to the tractus solitarius. A strand of fibers at *a* can be traced from the root well into the tractus descendens nervi vestibuli.

ninth and tenth, take up a position on its mesial aspect. Here, at the dorsomesial angle of the R. descendens octavi they bend caudad in the interoceptive column or tractus solitarius (Figs. 6, 8). There is practically a fusion at this point between the fibers running caudad in the tractus solitarius and those running caudad in the radix descendens nervi octavi, and many fine fasciculi from the entering roots seem to lose themselves in the tractus descendens (Figs. 9 and 10). This is more clearly brought out in a fortunate oblique section of the medulla oblongata of a three months' human fetus. This section shows the root fibers of the N. vagus penetrating in a large bundle as far as the interoceptive column and making up the tractus solitarius. A strand of fibers can be traced from the root however,

well into the tractus descendens. This is seen in the accompanying illustration (Fig. 22).

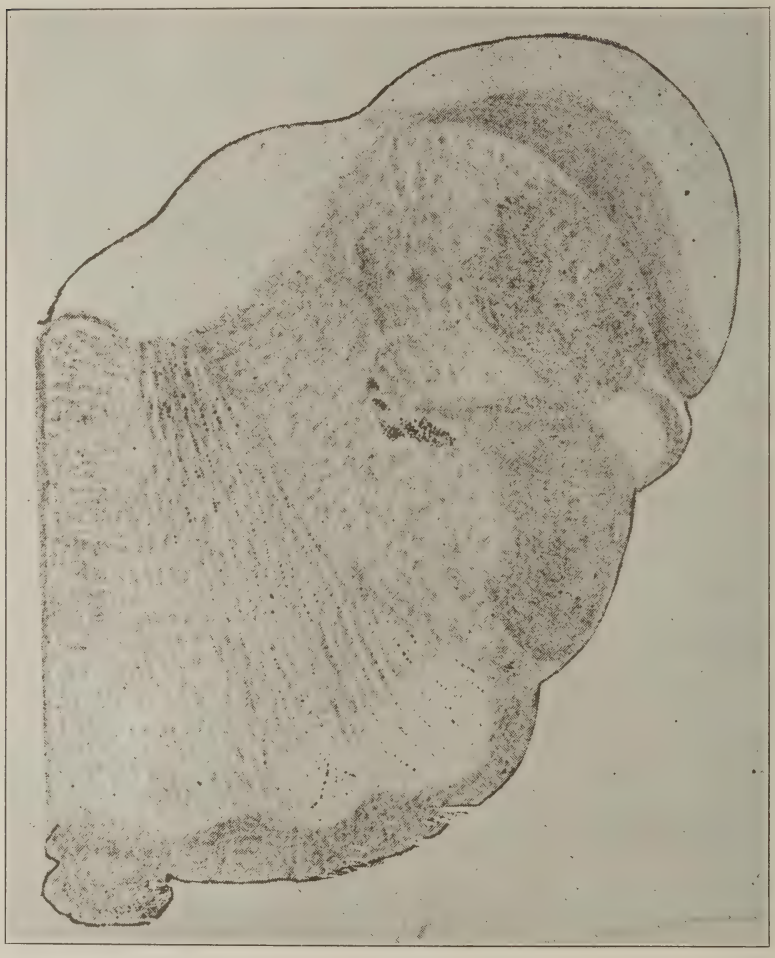


FIGURE 23. Medulla oblongata of a cat whose sensory division of the facial nerve had been avulsed. Marchi preparation. A few blackened fibers are seen in the motor division. The tractus solitarius is completely degenerated at this level, and two of the innermost divisions of the R. desc. N. VIII are blackened, showing that this root receives fibers from the sensory facial root. (FIG. 2 from vanGehuchten.)

It is very definite because the black-stained fibers are not numerous and stand out clearly in a pale field. Another piece of evidence is based upon an estimate of the number of fibers constituting the

tractus descendens nervi vestibuli above and below the level of entry of the tenth nerve. The count was made under oil immersion upon the medulla oblongata of a human fetus of six months stained by the author's silver impregnation method. At the lower level indicated, the tract appeared larger to the casual glance. An estimating count of the fibers on the two sides gave:

Above,	right 9700	left 9900
Below,	right 13100	left 13700

Experimental evidence is given by Van Gehuchten (65) although his interpretation does not concord with mine. In his study of the central terminations of the peripheral sensory nerves by avulsing them and examining the subsequent degeneration in the brain-stem he found that the degeneration led to the tractus solitarius. In regard to the facial nerve he says: "Examined under higher power Fig. 3, the root of the nerve of Wrisberg shows no exact limits. It is formed of small bundles of nerve fibers which have undergone secondary degeneration and which are placed on the one hand next to analogous fibers of the spinal root of the fifth nerve, and on the other next to the bundles making up the descending root of the vestibular nerve." From examination of the figures 2 (see Fig. 23), 3, 5 and 8 that illustrate the text, there seems to be no reasonable doubt that the fibers lie not only next to, but within descending root of the vestibular division. Similar conditions are found in the case of the ninth and tenth nerves.

Summarizing what has been noted concerning the eighth nerve we find that the octavus is a highly specialized portion of the seventh nerve subserving:

(a) Hearing, a special proprioceptive cognitive sense;

(b) Equilibration, a special proprioceptive automatic postural sense. Their sense organs are derived from the ectoderm.

The cochlear division engages the more newly developed lateral part of the proprioceptive column, here represented by the tuberculum acusticum and the nucleus ventralis acustici which lie in the lateral portion of the floor of the fourth ventricle. The secondary pathways for a certain distance, agree closely with the secondary paths of the rest of the proprioceptive cognitive system. The vestibular division is derived from the lateral line organs which were originally

innervated by three or more nerves. This specialized division of the seventh nerve, now known as the eighth nerve, has usurped the function of the others, but the original segmental arrangement of the primary receiving centers is still to be noted in the long intramedullary course of the fibers in the tractus descendens and the tractus ascendens nervi vestibuli. The tractus descendens is the homologue and the continuation in the brain-stem of the column of Clarke in the spinal cord, and as such receives fibers not only from the eighth nerve, but probably also from the seventh, ninth and tenth nerves.

(To be continued)

Society Proceedings

NEW YORK NEUROLOGICAL SOCIETY

The Four Hundred and Thirty-First Regular Meeting, Held in Conjunction with the Academy Section of Neurology and Psychiatry, December 7, 1926.
Dr. I. Abrahamson and Dr. T. K. Davis
Presided

HIGH CERVICAL LESIONS IN THE GUISE OF COMBINED SYSTEM DISEASE

Dr. E. D. Friedman

We have had occasion to observe two patients with high cervical cord lesion, in both of which the early signs pointed to combined system disease. Later evidences suggestive of a level lesion became manifest.

The first was a fourteen-year-old boy who complained first of increasing weakness of the lower limbs; later the upper extremities also showed loss of power. Shortness of breath, cardiac palpitation, and incontinence of urine were noted at times. Priapism occurred. Admitted to Mt. Sinai Hospital in July, 1920, he presented labored breathing, tilting of the head with the chin directed to the left, nystagmus in the horizontal plane, motor weakness, more marked on the left, disturbances in joint mobility and vibratory sense in all four extremities, astereognosis in both hands, ataxia with tabetic athetosis in the hands, general exaggeration of the deep reflexes, diminution of lower abdominals, bilateral Babinski, spastic-ataxic gait, a positive Romberg sign and cerebellar phenomena, more marked on the left. The general medical status showed no abnormalities. On one occasion sugar was found in the urine. Spinal fluid revealed no abnormal findings. Blood Wassermann proved negative. The case was considered a cross between the Friedreich and Marie forms of ataxia.

He left August 20, 1920, and four months later was admitted to Montefiore Hospital with the same complaints, now more pronounced. The pyramidal tract signs had become more marked. He had cross-legged progression and now presented hyperesthesia in the distribution of the upper cervical segments and tenderness over the upper cervical spine. Below this hyperesthetic zone there were mild disturbances in pain and temperature sense. He rapidly developed the signs of a transverse lesion of the upper cervical cord and succumbed.

At autopsy the upper cervical cord was found to be compressed by a mass springing from the odontoid process. This was composed

of dense fibrous tissue in which was embedded a bony nodule (osteo-fibroma).

The second patient was a fifty-five-year-old watchman admitted to Bellevue Hospital in July, 1924, who for seven months prior complained of sharp pains in both shoulders which radiated down the left arm and even into the left lower extremity. Four months later, he noted a similar pain in the right arm. He soon was unable to execute finer movements with either hand. Walking became increasingly difficult and there was some hesitancy in voiding urine. He also noticed a sharp pain in the left side of the neck radiating upward.

Moderate emphysema and mild athero-sclerosis was present. Weakness of the upper extremities, more pronounced on the left, and paresis of both lower limbs was present. Superficial sensation was intact but the joint mobility and vibratory sense were impaired from the shoulders down. There was astereognosis in both hands with tabetic athetosis and ataxia. Gait was spastic-ataxic. There was a positive Romberg sign. Abdominals were diminished. Deep reflexes were exaggerated. A right Hoffman and bilateral Babinski were present. The chief symptoms were those referable to the posterior and lateral columns. Spinal fluid showed no abnormalities except for a tendency to a paretic gold curve. Gastric analysis revealed hypochlorhydria. There were no evidences of pernicious anemia.

It was thought that we might be dealing with a capsulo-thalamic lesion on a degenerative basis. It was difficult, however, to reconcile the diagnosis of a cerebellar lesion with the absence of any changes referable to the cranial nerves. He was discharged for further observation.

Patient was readmitted in January, 1925, with the same complaints, but increasing weakness. Definite atrophy and fibrillary twitching were now present in the muscles of the left shoulder girdle. The sensory disturbances were the same as those previously noted, but there was now demonstrated an area over the left shoulder, in the form of an epaulette, in which pain, tactile and temperature sense were impaired. Patient held his head rather stiffly. Lumbar puncture now revealed manometric block and mild xanthochromia. The sensory changes soon extended upward to C_2. Faradic responses in the left deltoid and biceps muscles were diminished. Fibrillation was observed in both trapezius and sterno-mastoid muscles, but more especially on the left. Fluoroscopic examination of the diaphragm showed limited excursions on the left side. No Bence-Jones bodies were found in the urine.

It was now felt that we were dealing with a lesion near the foramen magnum with antero-posterior compression of the cord at C_2. It was advised that upper cervical laminectomy with partial removal of the foramen magnum be performed. This was done on May 1, 1925.

There was no evidence of bony disease. The dura appeared whitish and dense. The arachnoid seemed thicker than normal and

was definitely adherent to the cord and to the dura. Overlying the first and second cervical segments there was a dense whitish mass that seemed to mushroom out of the cord. It was quite thick and its caudal extremity spread out finger-like over the cord. Attempts to find a line of demarcation between this mass and the cord were unsuccessful. The cord was adherent to the dura on either side for a distance of two or three segments. The upper border of this mass presented a very sharp line of demarcation. This adhesive process seemed to completely obstruct the circulation of the cerebrospinal fluid. Except for the adhesions and the mass mentioned, the cord appeared normal. The pathological condition found explained the spinal block and the scar tissue probably accounted for the pain in this area. It was considered that the process was inflammatory rather than neoplastic (possibly luetic in origin). Microscopic study was not made. The patient survived the operation only twenty-four hours. No autopsy was performed.

Discussion: Dr. Bernard Sachs said: Dr. Friedman has presented his thesis in a splendid way. The same difficulties that he has met others have also encountered, not only the difficulty of making the differential diagnosis in such cases, but I have found the difficulty even greater where the lesion is in the mid-dorsal region. In the cervical region there are bound to be sooner or later symptoms which point to involvement of the brachial plexus, such as a certain number of cases which I have had under observation: for instance, a man who for two years has had distinct symptoms of involvement of both the posterior and lateral columns, the affection, however, at present involving only the lower extremities. There is no level lesion, and only very slight nystagmus, which has made me suspicious that the case might be an atypical disseminated sclerosis, but it is one of those cases in which it is just as likely as not that we shall have to consider the possibility of a slowly growing tumor in the mid-dorsal region. As I review the cases which Dr. Friedman has presented, I do not know that one could have made any different diagnosis in the earlier stages. It was only when the sensory level symptoms appeared that the diagnosis should have been made. Perhaps it could have been made a little earlier than it was, but the cases are of extreme interest, and we only encounter cases every now and then in which a diagnosis cannot be definitely made until the post-mortem examination or some unfortunate surgical experience proves the diagnosis.

Dr. I. Abramson said: I wish to call Dr. Friedman's attention to a patient who was in Mt. Sinai who presented for a long time the syndrome of multiple sclerosis. She then developed signs and symptoms of amyotrophic lateral sclerosis with respiratory difficulty, like Dr. Friedman's little boy. Later we were able to establish a definite level in the cervical cord. The disturbance of the spinal thalamic sensibility was at no stage very marked in this patient. The level was established by the zone of hyperesthesias; this patient also had vesical trouble, mainly incontinence. The case was operated on

by Dr. Elsberg, and the neoplasm was found at the level indicated. The patient survived the operation only for thirty-six or forty-eight hours. An important point in the differential diagnosis of high cervical tumors is the existence of early vesical trouble, not retention, but occasional incontinence. That little boy, if I mistake not, also showed incontinence of urine from time to time, which, combined with respiratory embarrassment, made me consider the probability of a high cervical tumor. In a series of cases collected by Dr. Grossman and myself, I found incontinence of urine a not infrequent symptom of high cervical lesions. In this little boy at the hospital I suspected a level lesion, but we could not prove it, as sensory level signs were absent. At the Montefiore Home, however, a very definite diagnosis was possible that we were dealing with a high cervical neoplasm; but the boy was not in shape to be operated on. In these conditions it is important to look very painstakingly for level signs. Dr. Friedman's second case complained of much pain around the shoulders. The moment you get level symptoms, hyperesthesias, or root pain, you must be on the lookout for a neoplasm, and then determine whether it is operable.

Dr. Friedman (closing the discussion) said: Dr. Sachs has stressed the difficulties of diagnosis, in addition to those I mentioned, and I want to thank him for his comments. I must apologize to Dr. Abrahamson for having given the impression that the diagnosis was not made ante-mortem. I thought I had made this point clear when I spoke of the advent of signs of a transverse lesion of the cord. There were four diagnoses offered: intramedullary disease, atypical Friedreich's ataxia, central gliosis, and extramedullary compression. One of the neurologists, a good observer, too, considered the case an atypical Friedreich, even at the late stage, in spite of the fact that level signs had been present. The existence of vesical symptoms is important; but in some cases of combined sclerosis we may, as a terminal event, obtain evidences of a transverse level lesion. Such cases have been operated upon for tumor of the cord erroneously. It is true that in viewing the cases in retrospect one can discern elements in both cases suggestive of cord tumor. The boy presented the peculiar tilting of the head, with the labored breathing, suggestive of high cervical lesion. He had occasional incontinence of urine and priapism, but disturbance of spinothalamic sensation was conspicuous by its absence and he had no hyperalgesic zones early in the disease.

In the second case, I believe if we had been able to get better coöperation from the patient we might have demonstrated the hyperalgesic zone which Dr. Abrahamson speaks of, and which we all feel is of great diagnostic significance. All of us examined this patient carefully for the existence of such hyperalgesia but no one could definitely outline such sensory disturbances. It was only later, when the pain shooting down the arm became more pronounced, the atrophy and fibrillation in the shoulder girdle more definite, that the clinical syndrome became manifest. The stiff carriage of the head led us to

probe more deeply into the disease, and then the diagnosis became clear.

HEMILAMINECTOMY

Alfred S. Taylor, M.D.

In the December meeting of 1909 the original paper on "Unilateral Laminectomy" was presented. It is now called "Hemilaminectomy" because of the custom among most writers. Most neurological surgeons think the method has no advantages. The usual operation, "bilateral laminectomy," has been perfected and made easy but there are conditions in which hemilaminectomy has decided advantages. Before discussing them it should be stated that special instruments, designed for the purpose, are essential to the satisfactory performance of this operation. With the use of these instruments it is possible to remove the laminae of one side so as to give an exposure fully as wide and usable as that obtained in the usual bilateral laminectomy.

It will be noticed that the exposure indicated in the pictures is at an angle very favorable for the exploration of the cord with very little manipulation necessary. The following things have been repeatedly done without damage to the cord:

Exploration of the spine at all levels (with lumbar lordosis and thick muscles the procedure is difficult and unsatisfactory).

Dorsal ramisection on one or both sides.

Unilateral chordotomy can be accomplished with perfect ease, but bilateral chordotomy cannot be done.

Exposure of spinal cord tumors with their removal. These have frequently been done; tumors have varied from 3 to 5 cm. in length and 1 to 2 cm. in diameter. They have been ventral; they have been lateral; they have been dorsolateral. They have been removed so that there has been no evidence of damage to the cord from necessary manipulation. Intramedullary tumors have been explored, decompressed by splitting the cord and leaving the dura unsutured. One chondroma on the ventral aspect in the cervical region was removed with rapid improvement on the part of the patient.

Exposure of adhesive arachnoiditis simulating tumors.

Exposure of "meningo-myelitis" simulating tumors.

Therefore, hemilaminectomy can be used with safety to the patient; and most of the things usually done through bilateral laminectomy can be accomplished through a hemilaminectomy.

The question is, whether under certain circumstances hemilaminectomy possesses such decided advantages over the usual procedure that it ought to be the method of choice.

Remember that in hemilaminectomy the laminae of one side and the spinous processes are left intact together with their muscular and ligamentous attachments, a great stabilizing item. This is particularly true in the cervical spine. When complete laminectomy is done the ligamentum muchae is more or less destroyed and the only supports left to the neck are the intervertebral disc and the

ligaments between the bodies of the vertebrae and articular processes.

Three cases are cited in which bilateral laminectomy in the cervical region was followed by dislocation of greater or less degree; in one case leading ultimately to death; in the third case probably causing death, and in the second case causing no trouble.

In the lumbar and sacral regions, if bilateral laminectomy is done, if there is a tendency to spondylolisthesis, then the patient has very little support against a recurrence of this disability and there is no bone so situated as to permit fusion of the spine or bone implant which would give sufficient rigidity to prevent this accident. Illustrations are given of these conditions.

Ventral and ventro-lateral tumors can be approached and disposed of through the lateral exposure natural to hemilaminectomy with far less manipulation of the cord than is feasible in the usual laminectomy.

Finally, it should be stressed that if hemilaminectomy is used for exploration and a condition is found which cannot be properly handled, it is the simplest thing in the world to convert the exposure into a bilateral laminectomy, involving as much of the field as is necessary.

Various cases were cited to illustrate and prove the assertions made in the body of the paper. Lantern slides were also used.

Dr. Byron Stookey said: I am afraid that I am one of those to whom Dr. Taylor has referred who did not do justice to this operation until Dr. Taylor had demonstrated its value and its possibilities. The aim of any surgical procedure should be to obtain the maximum exposure with the least disturbance of anatomical and physiological function. Witness, for example, the change from the older method of the exploration of the brain as done by Sir Victor Horsley, in which the bone of the cranial vault was removed without regard for cranial defect, to the method of osteoplastic flaps now used by which a flap of bone is turned down and again replaced, so that the patient is left with a minimum anatomical deformity and yet an excellent exposure obtained. So I think with laminectomies a similar evolution has occurred. Until Dr. Taylor introduced this method of hemilaminectomy a bilateral laminectomy has always been done and no other method considered. I do not know why a great many surgeons have been opposed to this procedure, except that it is a great deal more difficult to do. It requires a greater amount of skill, technique, and a longer time, and also special instruments which Dr. Taylor has designed and without which the operation cannot be done. If anyone has tried this operation with ordinary rongeurs, he has undoubtedly met with considerable difficulty which has made the procedure without proper instruments almost impossible. With special rongeurs as devised by Dr. Taylor adequate exposure of the spinal cord can be obtained. Many instances of laminectomy are exploratory. Of the neoplasms most often missed at exploration I think the ventral tumors, in particular the extradural tumors, are those most likely to be overlooked, even in a bilateral laminectomy. With a unilateral laminectomy the ventral

tumors are particularly well brought into view. The dorsal tumors are readily seen anyway and are not likely to be overlooked, since they are exposed as readily as the cord itself. Ventral tumors, on the contrary, are often extremely difficult to find and not infrequently are overlooked, even when their presence is suspected. With a hemilaminectomy in which the ventral part of the cord and dura are especially well brought into view, these tumors are less likely to be missed. I recall helping Dr. Taylor do a laminectomy on his neurosurgical service at Bellevue for a ventral chondroma which was small and placed in the midline, somewhat on the side of the exploration. This tumor was taken out without difficulty through the best exposure of the ventral surface of the spinal cord I have ever seen.

I have seen similar tumors which could hardly be reached by a bilateral laminectomy. Consequently for a ventral tumor hemilaminectomy to my mind is the procedure of choice.

How are we going to know that a tumor is ventrally placed? I do not believe that one can make a diagnosis *a priori* in some of the patients but not infrequently after a thorough neurological study we have enough evidence to suspect a ventral tumor. In two instances at Bellevue within the last year on Dr. Kennedy and Dr. Taylor's service, ventral tumors were diagnosed before operation and successfully operated. There are two regions of the cord in which a hemilaminectomy is particularly indicated, one the cervical region and the other the lumbar region. A patient who had a cervical cord tumor with removal of the tumor by a bilateral laminectomy made an uneventful recovery, but six months later he returned with a more or less forward dislocation of the neck. I had never encountered this deformity in any of the bilateral laminectomies before. I reviewed the original plates, and thought I saw a slight bony defect which was not appreciated by the roentgenologist or myself before the operation. It is now two or three years since the operation during which time he has had to wear a Thomas collar. He has now begun to have some union of the two bodies of the vertebrae, so that eventually I think he will be able to go without a Thomas collar. In the cervical region, where the vertebrae are so freely movable, hemilaminectomy is the procedure of choice, at least as an exploration, and until pathology of such magnitude is uncovered that it can not be dealt with by a hemilaminectomy. In the lumbar region hemilaminectomy is not so simple. I have assisted Dr. Taylor in operating many times, and he has always operated with a great deal of ease but a hemilaminectomy in the lumbar region is difficult and requires considerable skill and practice. However, a splendid exposure can be obtained. For the maintenance of the body posture, it is desirable to preserve in the lumbar region as much of the vertebrae as is possible, and this operation, as Dr. Taylor has adequately pointed out, does permit one to obtain a wide exposure with a minimum anatomical disturbance. I am sure that the patient who had a liquefied disc with some bone destruction whose X-ray he showed, and in whom he was forced to do a bilateral laminectomy, will have

had some difficulty in maintaining proper posture. When there is bone destruction by tumor further loss of bone substance may be avoided by hemilaminectomy.

I think that hemilaminectomy has a very definite rôle in neurological surgery. Dr. Taylor gave to us some seventeen years ago a procedure of great value which is bound to make its own place in neurological surgery. Surgeons in many cities, Boston, Rochester, etc., are beginning to do this procedure which Dr. Taylor gave us some seventeen years ago, and which we have not had the good judgment to use until it has begun to be revived.

Dr. Sachs said: As a neurologist, all I can say is that I admire Dr. Taylor's very conservative method and very conservative statements regarding it. The method is surely in line with the best canons of the art, and inasmuch as it is extremely conservative and adequate, has everything in its favor. So far as the operation is concerned, in cases of cervical tumor it seems to be unquestionably better than bilateral laminectomy would be. In fact, the very sad ending of one of the cases with the dislocation of the cervical bodies, would make one hesitate to resort to bilateral laminectomy unless it were absolutely necessary. In the case of lumbar tumors, if we can possibly achieve what we wish to accomplish by unilateral laminectomy, that would be the method of choice. In all exploratory operations, so far as my judgment would amount to anything, I should say begin with a hemilaminectomy and then resort to the other if it is found absolutely necessary.

Dr. Taylor has rather unconsciously drawn a line between neurologists and neurosurgeons. He said "if the patient would only recover from his neurological symptoms." Might I request that he say the patient has spinal or sensory symptoms, but not necessarily neurological symptoms, or one could go to work and say we hoped the patient would recover from his neurosurgical condition.

I must congratulate Dr. Taylor on the discovery of a method which seems to be admirable, and I hope that the neurosurgeons, who have not always been ready to adopt new methods, will fall in line towards hemilaminectomy much more generally than in the past seventeen years during which this method has been known.

Dr. Foster Kennedy said: It has been my privilege to see Dr. Taylor's results and to compare them very favorably with the larger operation of ordinary bilateral laminectomy. Sir Victor Horsley used to say that, from his observation, it took twenty years from the introduction of a new idea for it to become accepted by the profession. It seems that this period of time has elapsed in a number of instances, and I do not think that Dr. Taylor ought to be disheartened by the time yet to go. I believe that in the next three years this operation which Dr. Taylor has been demonstrating to the surgical profession will be adopted largely, and that the exceptional operation will be bilateral laminectomy.

Dr. Taylor (closing the discussion) said: I want to apologize to Dr. Sachs for having slipped up in English about the neurological

trouble. Also I want to commend Dr. Sachs for having got the real point of the paper. The operation should be done as an exploratory thing, and then continued or not as the individual case demands. It is so simple to make a bilateral laminectomy if necessary, and as far as necessary, that the whole thing lies in knowing the situation and finding out what you are going to deal with, and if you can do a unilateral laminectomy, well and good. If you cannot do it, you can do the other thing in a few minutes' time, and get all the space you need without having wrecked the whole spinal column to start with.

THE MEDICAL EXPERT IN THE COURTS *

FOSTER KENNEDY, M.D.

[ABSTRACT]

The fight for the recognition of individual rights from Runnymede to the Great War is briefly traced. The part medicine has played in the past for the protection of the individual is cited in the conquering of yellow fever, the plague, etc. In psychiatry a prophylactic viewpoint is aimed at in examining the heredity and environmental stresses of the insane, and in the effort to comprehend their problems and aid in their adjustment.

To abolish or mitigate mental and moral ills we shall have to do more than the priestly function of psychoanalysis. We must control heredity, we must segregate and prohibit from increase the proven unfit.

In the criminal courts, we, as a body, are in the main reversing these aims. We are protecting the individual criminal from society when society has as yet made no plans whereby in the event of release on present charges, the criminal might be prevented from anti-social acts in the future. A public health attitude must be adopted in this matter, and it must be proclaimed that psychiatry cannot properly work through the existing criminal code, that justice is diverted by the absurdity of hypothetical questions, that 12 laymen cannot be expected to appraise nicely the degree of responsibility of a paranoic or a high grade moron, and that the differences of opinion between lawyers and doctors, and doctors and lawyers, buttressed, if not directed by funds from opposed interests—gossiped and wrangled out in the courts—elevate crime, debase law, and prostitute medicine.

The real point at issue in a trial in which the defense is a plea of insanity is not whether or not the mind was unsound, but was it sufficiently unsound so as to be unable to determine right from wrong, or if so, was the accused a victim of irresistible impulse to commit the act as charged in the indictment.

The question of responsibility for crime has been moot between lawyers and medical men from the time of Lord Erskine and the McNaughton case in 1843, down to the present day, when calcification of the pineal gland has been advanced as a reason why a criminal

of eighteen should be shown preferential treatment for his murderous peccadilloes.

The whole system whereby a defendant employs and pays for medical opinion in the courts is wrong and should be abolished; a defendant should have no more constitutional right to pick his medical expert than he has to pick the policemen who arrests him or the judge who presides at the trial. Acquittal on account of mental disease or semi-mental disease, often a feeble release of wolves to prey on the people, should no longer be toleratd. Psychiatrists and jurists on both sides of the Atlantic have been feeling their way towards realization of some of these ideas in the practical working of the courts. The American Institute of Criminal Law recommended recently the following program: 1. That in all cases of felony or misdemeanor punishable by prison sentence the question of responsibility be not submitted to the jury, which will thus be called upon to determine only that the offense was committed by the defendant. 2. That the disposition and treatment (including punishment) be based on a study of the individual offender by properly qualified and impartial experts coöperating with the courts. 3. That no maximum term be set to any sentence. 4. That no parole or probation be granted without suitable psychiatric examination. 5. That in considering applications for pardons and commutation, careful attention be given to reports of qualified experts. A sixth recommendation should be included in this program: that a panel of qualified medical opinion be chosen if possible from university and major hospital staffs, who would advise the consciences of the court, who would receive adequate remuneration from no private individual or corporation, but from the State and from the state and from the state only. The third provision, that no maximum term be set to any sentence of imprisonment or segregation, is of the highest importance, for when incurable people, such as morons, slightly feebleminded persons, constitutional inferiors, mildly psychopathic individuals, etc., have proven their instability by crime, we, as a herd, have a right to demand their segregation probably permanently, but certainly prolonged, depending on the natures of their eccentricities and of their crimes. Let us banish mawkish sugary sentimentalism, let the law do its duty and do it quickly and let us doctors put our knowledge at the disposal of the state and of the courts, but not ply for hire among the unstable, the eccentrics, the psychopaths and the dregs of the underworld.

Discussion: Dr. Joseph Collins (by invitation) said: Aristotle said that a speech consists of two parts, one a statement of the case, the second part was to make it good. I think Dr. Kennedy has stated the case very well. I am not so sure that he has been so successful with the requirements of the second part. It is an indication of maturity, perhaps of crossing the Rubicon, that one concerns himself with expert testimony. There probably is no one in this audience, who has suffered change of life, who has not spoken or written upon it. I have heard the substance of what has been spoken here ventured in varying keys many times. Dr. Kennedy

opens his address with some remarks on our neglect of society as a whole, and of our attention to the rights of individuals. Now we do not have to look very far to see that that does not exist the whole world over. There is an example of crass individualism going on in the world at the present time which seems to get the sympathy of a large number of the articulate people throughout the entire world, namely, the experiment going on in Italy. That is individualism with a vengeance, and not with much concern for the group which constitutes society. I am not so sure that the world is not witnessing an effort to get over the bulwark of liberty, and that this is not a continuation of our endeavor to make individualism the whole thing. But I do not want to discuss that. That was really only an introduction to this entire subject. The gravamen of this entire situation, as presented by Dr. Kennedy, is contained in two things: first, that the hypothetical question is an abomination, and second: that the way of eliciting and obtaining expert testimony should be changed. There is no one here mean or contemptible enough to say a word in favor of the hypothetical question; everybody agrees; but it is like death and taxes; it is inevitable. We have got to put up with it. We can delay the former and ameliorate the latter. That is all we can do with the hypothetical question. Who is responsible for the hypothetical question? Who frames it? We frame it. There never was a hypothetical question that we experts were not asked either to frame or to supervise. We inject into the hypothetical question some objective which will permit us to answer in favor of the person or institution which employs us, and at the same time eases our conscience. There is a way by which the hypothetical question can be, if not cured, enormously improved. It has been suggested before. I even have suggested it: there should be but one hypothetical question; one which embraces all the facts that have been presented by the state and by those who represent the prisoner, and that the hypothetical question should be asked the experts on both sides. If that were done, the hypothetical question would be relieved of the enormous charge that can be made against it, namely, that it facilitates injustice rather than justice. If we wish to help the legal profession in a way that will permit them to avail themselves of our expert services we can do it by getting the Bar Association and the medicolegal associations to agree that the hypothetical question should be prepared in that way, and in no other way. The procedure of the hypothetical question is exactly the same thing that we as physicians constantly face in reaching a diagnosis. Why should lawyers be denied a procedure that we find so useful, and essential? In the hypothetical question we are asked to assume that so and so are the facts. When a patient is brought to me, and I am asked to pass on his sanity, I assume that what has been told me by those who brought the patient are facts, and then I can use whatever capacity for interpretation, detection, or discrimination that I have to see whether they are facts or not. That is exactly what the expert is called upon to do with the hypothetical question, and that is what the jury is called upon to do. The

hypothetical question is exactly what the jury system is: an outgrowth of necessity; an evolution of the process of law. We cannot and should not get rid of it. We should better it.

Now for the second part: expert witnesses and testimony. There are four kinds of expert witnesses: There is the expert witness who does not know, but who does tell it; also the expert witness who knows and cannot tell it. There is the expert witness who is truthful and the expert witness who is a liar. Those are the four kinds of expert witnesses. Dr. Kennedy has suggested a method by which expert witnesses should be called. I am not in agreement with him at all that the individual does not have the right and should not have the right to call upon any one that he chooses to give expert testimony. I have witnessed in a comparatively short life too many curtailments of the liberties of the individual promised by the Constitution. Why should a criminal be deprived of the right of calling expert witnesses to testify in his behalf? Until he has been proven guilty he should have the rights conferred upon him by birth even though he was born in sin. I heard Dr. Sachs 25 years ago, or more even, say in this Society that experts should be called in very much the same way as Dr. Kennedy has suggested. He has waited longer than the twenty years of Sir Victor Horsley, and he is still a voice crying in the wilderness. I made a suggestion a year ago last January, in *Harper's Magazine,* which was that the expert witnesses be obtained in the following way: That the Academy of Medicine should send to the presiding judge of the Appellate Division of the Supreme Court a list of names of men who are qualified by study, by character, and by experience to give such testimony. These would be retained by the state as expert witnesses and they should have a retainer, a yearly stipend; and whenever an expert witness was needed one could be supplied. We have recently been through a farcical trial in New Jersey. Here the experts dealt with "finger prints." Three experts swore they were those of Willie Stevens, whereas three others pointed out to the perception and intelligence of the jury and apparently to the satisfaction of the whole world that those finger prints were not the finger prints of Willie Stevens. Suppose the testimony of the first three experts had been accepted. Willie Stevens would now be languishing at the foot of the gallows. One half of all expert testimony is bunk. That is the real truth about it.

One might readily gather from reading Dr. Kennedy's paper that prisoners who are declared insane go scot-free. They don't. They go, as you well know, to asylums for the criminal insane. There is a choice between hell and Dannemora. Now that the former has been deprived of some of its terrors a goodly number of criminals probably choose it. I am sure that they would choose Sing Sing. When an insane criminal recovers, and parenthetically insanity recovers in a criminal with the same frequency that it does in priest and reformer, then he is put on trial again. If he does not recover he stays where he has been put and that is punishment for any crime save bootlegging.

I do not quite understand what Dr. Kennedy meant by preferential rights or treatment referring to the Loeb case. Those criminals got life sentences. That ought to satisfy anyone or everyone who is not gaited like Pekah. The truth of the matter is, I think, that criminals, despite us doctors, get what is coming to them in the vast majority of instances. They do not get it as soon as they should, for everyone admits there is lamentable delay in bringing them to trial, but they get it eventually. That some of them are able to use money to their advantage goes without saying. When the time comes that they are not, that will be the millenium.

We have got two things to do: the first one is to change the hypothetical question; the second is to adapt some means for the elimination of the crook as an expert. Now Dr. Kennedy has called your attention to the fact that some of the recommendations made by the American Institute of Criminal Law are most deserving; but I want to call your attention to the fact that three of those recommendations are already in effect. At the present time no parole is granted in this state without suitable psychiatric examination, and careful attention is given to every demand for parole. I call your attention to the fact that it is the increasing custom in this state and throughout the country, in the courts that the history and environment of the offender be looked into most carefully before sentence is pronounced. I am in full sympathy with Dr. Kennedy's closing sentence providing that he will change only one word. He says: "Let us abolish sugary sentimentalism; let the law do its duty and do it quickly, and let us doctors put our knowledge at the disposal of the state and of the courts, but not *ply* for hire among the unstable, the eccentric, the psychopath, and the dregs of the underworld." If he will change "not ply for hire" to read "not lie for hire" I am in full agreement with him.

Dr. Smith Ely Jelliffe said: It is interesting to hear once again of Runnymede and the Magna Charta and to learn from these and later glorious achievements that it took so long for the individual to get any rights at all.

In fact we sometimes doubt whether that safeguarding of the liberty of personal action has been so well acquired as our learned reader of the paper of the evening has assured us. In fact, I hope I do not appear somewhat hypercritical if I seem to detect in the opening sentences of this paper a blowing hot and a blowing cold—now it is the individual who has all the rights—now the masses. If the Great War was one for individual rights, and the bloodless struggle (I presume Dr. Kennedy is referring to the British General Strike) one for the masses, wherein do we find that just discrimination that I feel sure our orator would counsel. Certainly not with us here in the United States in the Prohibition Movement—that monumental bit of legislation which would even deprive the future [present] President of our Academy of Medicine to prescribe for human beings what he considers right and wise for him to prescribe in the event the prescription should contain C_2H_5OH. Think of

it, five chief justices of the United States as opposed to four chief justices of the United States presume to tell the doctor what he should prescribe for sick humanity. Is this Runnymede—or Magna Charta—or just "Blind" Justice?

But this is possibly an aside from the issue we are called upon to consider. No one, least of all myself, would dispute the gravity of the situation to which Dr. Kennedy, like many another before him, has pointed his finger in the second paragraph of this paper. Eleven thousand homicides—nine-tenths of which I venture to suggest hinge upon the very issue I have just spoken of—namely prohibition. This is a terrible thing to contemplate and the comparison from typhoid or Boer War material is not needed to make one shudder and creep. But has Dr. Kennedy put his finger on the real spot when he calls this "rampant *individualism*"? Might I rather say that it is a direct result of bullnecked legislation in its muddle-headed effort to try to treat medical and evolutionary problems by law.

Dr. Kennedy assures us that *Law* is an instrument for the protection of society—but he forgot to say what kind of law. If he said that *good* law was an instrument for the protection of society I say—*Amen.* But what about *bad* law? Is there no such thing as *bad* law? Are we all hypnotized by the belief that "L A W" is sacrosanct and one needs be a socialist or a bolshevik because he dares to distinguish or suggest that such a distinction is possible?

I yield to no man in my belief in the high calling of medicine both in its individualistic as well as in its prophylactic orientation. *We* did build the canal—and *we* have made it possible for millions to live longer, and be happier than ever before, and *we* don't need a yellow press, or a Saturday Review of Literature to "tout" our achievements. And may it be said that a dawn is slowly breaking when a man's mental equipment may be judged in a better light than his physical one. This, I take it, is what Dr. Kennedy refers to when he speaks of mental hygiene.

I said the dawn was breaking—but is it here? I shall never forget a story told by one whom we all as neuropsychiaters, love, Dr. Pearce Bailey. In his slow grim way he narrated how during the late war thousands of individuals were rejected as soldiers because they had "flat feet," but when it came to "flat heads" why they took them in. One can readily understand how flatfootedness almost became epidemic in 1917.

I regret to have again to lock horns with Dr. Kennedy—not this time on his statistics, but upon his allusions to the Platonic-Aristotelian bipolarity. There is really no antagonism between Vitalists and Materialists—between Functionalists and Structuralists. Dr. Kennedy and I have married them repeatedly, but I would call attention to the nature of the two marriages—with Dr. Kennedy I fear 'tis a "*mariage de convenance,*" with me 'tis a real love marriage, and function and structure are one—and mind is but one of the functions of living matter. Soma and Psyche were born together, and let us hope ever will remain so. And as to all this senseless wind-

jamming about mind and matter, the words of an English thinker may be recalled when he said, regarding "mind, no matter; and as for matter, never mind."

But our essayist progresses by a prodigious leap when he advances the proposition that "we as physicians must *control heredity.*" Imagine the magic wand we must possess to alter a billion years of life's experiences on the globe; and also "we must segregate and prohibit from increase the proven unfit." Proven by whom? Five supreme court justices or by some other legally appointed authority? Who is more fit than another? and by what yard stick are we going to measure human personality? I think Dr. Kennedy puts it—"we must discover the seat of the vital rhythm of personality." Where have I heard that phrase? I confess it means little to me—even as a follower from afar of the so-called "cult" to which Dr. Kennedy attaches the title "priestly." I suspect our essayist "strains at a gnat"; let us hope that he will avoid "swallowing the camel" of mundane materialism.

Dr. Kennedy states that in our criminal courts "we as physicians act sometimes as brakes." "We would reverse the aims of the courts." I would like to challenge him directly. How many of the 11,000 homicides he mentions, *through their lawyers,* have put in a defense of insanity? I do not think he can answer. In fact, I might even go further and state that the vast majority of the few who are apprehended would rather put in a defense of murder of a lower degree, than put in the defense of insanity—and why? My own personal experience makes me state that the vast majority of homicidal prisoners prefer to take their chances in jail rather than in the state hospitals.

When our essayist states in the seventh paragraph of his paper that "society as yet has made no plan whereby, in the event of release on present charges, the criminal might be prevented from antisocial acts in the future" he makes, I believe, a serious misstatement. Society *has* made a number of plans, one of the most significant of which is to lock the individual up in a state hospital—Matteawan or Dannemora—in New York, and "believe you me" in current phraseology, those are the two places in this state where the criminal *does not wish to go.* This is a very poor place for us or for him to discover the "vital rhythm of his personality." Every so-called criminal with whom I have come in contact has much greater fear of being considered a "nut" than the average man in the community. If there are any prison wardens in the audience I hope they will correct me in this impression.

I am glad to agree most cordially with Dr. Kennedy that the existing criminal procedure is an abomination; but I do want to insist in the same breath that we as *physicians* did not make it. I would tread a little more lightly upon the matter of the hypothetical question. Here matters of procedure and modes of presentation of evidence get closer to the legal frame, and I suspect, we may not know as much as we think we do in view of the growing body of experience in law. Because American jurisprudence does not accept

our medical methods of investigation, it does not mean that the hypothetical question is absurd, even though we, as physicians, know it is riddled with medical absurdities. The law, however, is working with a different frame, Einsteinally speaking, and it may not be as foolish as we think it is.

And finally when Dr. Kennedy would attack the jury system—ludicrous as it may appear in a Johnson caricature—is he not treading rather roughly upon Runnymede and the Magna Charta? For after all are not the twelve men good and true a symbol of the community? Is not our essayist a more or less peremptory Prussian when he would attack that ancient and honorable tradition, the "jury"? I confess that from my own point of view, I have seen many a foolish jury, but, one may notice I say "my own point of view." And who among us can claim omniscience?

After all the twelve men good and true are not necessarily all simpletons—such as we might think them. They are very often astute "wise guys" that know a lot more than we do about the "rhythm of personality." They sell a thousand hats in a day, or 7,000 stockings in a week and often are in much more intimate contact with the "rhythm of personality" than we are, as physicians, wondering whether a little arsenic or a little pituitary will help this or that ailment.

And now to questions of theory. I am compelled to disagree with our learned essayist. We have, let us say, 48 states in the Union; 23 have one series of tests; 25 have another, and they all vary as to the tests for responsibility for homicidal acts, testamentary capacity, contract capacity, ability to confer with counsel, etc. Dr. Kennedy does not particularize, and if he is quoting New York law on the issue of responsibility, he is misquoting. Across the river in New Jersey one can get away with an "uncontrollable impulse" but not in New York. "Lord Bramwell and McNaughton" are all right in English jurisprudence but they really cut no ice in America in medicolegal matters. In fact, the McNaughton situation has practically little relevancy in American court decisions. The 1843 issues in England, dear to the medicolegal literati, have long ceased to be of significance in the United States.

Specifically, Dr. Kennedy states that the defendant has no right to employ expert opinion. It grieves us greatly but the Constitution of the United States does not agree with Dr. Kennedy. We are sorry for the Constitution, but also sorry for Dr. Kennedy that he should not have informed himself more accurately on this minor issue, which he compares to the right of an individual as to what policeman should arrest him. This is one of those comic statements that throws one off one's guard if one is not careful.

"Acquittal on account of mental disease should no longer be tolerated"? In other words no criminal acts are ever committed by diseased individuals? This is certainly an absurd conclusion. Especially since Dr. Kennedy himself tells us of the behavior changes in encephalitis.

And finally we have the recommendation of the American Insti-

tute of Criminal Law. Dr. Kennedy banks large upon this pronouncement, concerning the evolutionary history of which one suspects he is not altogether familiar—as a special pleading.

I admit that "woolly intelligentsia" receive their adequate exploitation in the "Daily Graphic" or the "New York American," but these are only "rationalizations" of making silk purses from sows' ears; but fundamentally the twelve men good and true are not always such apes as one might be led to infer from the discussion.

Dr. M. Allen Starr said: After this very brilliant paper, and the very witty discussion by Dr. Collins and Dr. Jelliffe, I fear that all I have to say will sound rather dull, but I wish to remind Dr. Sachs and others that this matter came up very seriously before the Academy of Medicine in the early nineties at the time of the extraordinary interest that was taken in the medical testimony in a certain case. At that time there was a great deal of sentiment among the members of the Academy of Medicine that some effort should be made by the members to remedy the state of affairs which was practically a scandal, that large numbers of so-called experts, who were not experts, could be brought up into court, and establish the capacity of the medical profession, as Dr. Collins would say, for lying. At that time the President of the Academy, Dr. Edward G. Janeway, appointed a committee consisting of Dr. Dana, Dr. Janeway, and myself to take this matter up before the Bar Association and the judges of the Appellate Division, then Judge Barnet, Judge Ingraham, Judge Gildersleeve, and Frank Scott, who were all very eminent members of the Bar. We met with them and tried to devise some method by which this scandal could be avoided in the future. The scheme that the committee evolved was this, and the judges backed it up very decidedly, that the plaintiff should have the power of choosing a medical expert; that the defendant should also have the power of choosing a medical expert, and that the judge of the court before whom the case was coming up should himself appoint a medical expert, preferably a man who was either a professor in a college or at the head of one of the state institutions, like Matteawan or Dannemora, and that these three physicians should examine the person accused of insanity and bring into the court a report, which report necessarily would be either unanimous or two to one on one side or the other; and the judges thought it wise to suggest that the fees of each of these men should be settled at law by the judge and not dependent upon the capacity of the individual who was the defendant, perhaps, willing to pay large sums, and that the jury should be guided in their verdict by the report which was brought in. But there again the difficulty at once arose that every defendant had the right to call the whole United States in his defense if he chose to do so, and that this scheme would be an infringement of the liberty of the individual. That was the scheme that was adopted here in the Academy of Medicine and in the Bar Association, and I assure you, although Dr. Kennedy and Dr. Collins have thrown a certain amount of doubt on the lawyers, they

are just as anxious about the matter as we are; and they are anxious at the present time, because the day before yesterday Henry Taft told me that the Bar Association at present has a committee appointed to study this matter, and see if they cannot work out some scheme to set right the matter of expert testimony before the court. I do not think the Bar Association is indifferent to this matter, and I think that if we could come to any definite conclusion or definite recommendation which we could send to them, it would meet with their approval, or at any rate with their favorable consideration. But up to this time neither our Academy of Medicine or the Bar Association has found any definite method.

There is a method which is in effect and has been in effect for 25 years in Germany, which has always commended itself to me very decidedly. An individual is arrested for a crime. The question comes up in his defense that he is mentally unsound. In Germany, when a plea of that kind is brought up, the matter is suspended at once, and they commit the individual to a psychiatric institution entirely unprejudiced, that is to say, not under the control of the court, but an unofficial psychiatric institute, where the man is placed for a matter of two to six weeks, and while there he is very carefully examined by individuals who are known to be expert, and those individuals combine upon a written report. You will see such reports all through the *"Neurologischen Centralblatt,"* quantities of such official reports submitted by doctors qualified by the state as experts of the court, and in a very few instances are those reports in any way overruled.

Now of course I am not sure that it would be wise to confine any suspect to Matteawan or Dannemora under the present conditions, but if we are going to have a psychiatric institute in New York under the direction of such a capable individual as Dr. Kirby, it seems to me that we have a solution of this problem, that we ought to consider, and that we ought to think of the possibility of suggesting to the court and to the Bar Association that this German method be adopted as a measure out of our present dilemma. That is the only thing I have to suggest in addition to this discussion.

Dr. Emil Altman said: I have nothing to add to what has been said about criminal procedure. No one can add anything to the schemes and to the experiences which have been expressed here to-night by three leaders of psychiatry. In connection with the activities of the Chief Medical Examiner of the Board of Education the educational authorities and the Medical Division receive testimony and certificates from experts that are at such variance with the facts as to make them a gross reflection on the integrity of both physician and teacher.

Dr. M. Osnato said: I am wondering if this discussion is timely or even necessary so far as the State of New York is concerned. If you will follow the career of the criminal from the time he is arrested until he reaches the death house at Sing Sing, you will see that from the psychiatric side he is very well looked after. Recently the policemen have been taught by Dr. Lahey of the Police

Department, a very well trained neuropsychiatrist, and by Dr. Gregory of Bellevue, in systematic courses which have been thoroughly given. These courses are calculated to enable officers to recognize the common symptoms of mental disease. The average detective is now more or less familiar with the outstanding features of mental troubles, so that the offender is observed by a partially trained individual as soon as he is arrested. In the station house the observation may be extended over several days. When brought before the magistrate, if there is any suspicion of insanity, the offender is remanded to Bellevue for observation and Dr. Gregory's opinion is nearly always final and determines the judges' action. As Dr. Collins has already mentioned, the courts are supplied by the machinery of the probation system with the result of investigations which report on the social status of the individual and his behavior over an extended period of time. The judge who must sentence the offender has before him, therefore, very considerable data regarding the personality and the behavior of the individual. If anything arouses the judge's suspicions as to the mental fitness of the offender, commitment to Dannemora follows, after a period of observation at Bellevue.

During the criminal's stay in the Tombs, he is subjected to an examination by the Tombs physician, an individual who has considerable practical experience in the detection of mental disease. If during the man's incarceration mental disturbances are manifested, that fact is recorded and the judge then appoints a lunacy commission consisting of a physician, a lawyer and a layman whose duty it is to call witnesses, including expert witnesses who are usually the Bellevue or Kings County psychiatrists. When the case is tried, the judge is completely cognizant of all the psychiatric features of it. The indicted insane offender must automatically be sent to Matteawan if found insane.

Once convicted, if the mental situation develops after imprisonment, that situation is also provided for and after a commission finds the offender insane he is sent to Dannemora. The commission usually consists of three of the superintendents of the State Hospitals, whose duty it is to examine the offender and make recommendations. This commission also examines and reports on every man in the Death House at Sing Sing.

I think you will find, if statistics were gathered on this point, that the difficulty is in the borderline cases occurring in offenders who are wealthy or who have wealthy individuals interested in them. They will often go to almost any extremity to prevent the proper administration of justice. Then one has to deal with the weaknesses of human nature and as to that experts are not exempt. It is a very understandable thing why in such cases differences of opinion are found and often do occur in experts. I do not believe that the situation occurs frequently wherein a criminal case has ranged on opposing sides mental experts who do not agree in their testimony regarding the mental status of the patient. So far as this state is concerned, I feel that this discussion is not timely and it does

not seem to me that the Society as an organization need do anything more about it.

Dr. Kennedy (closing the discussion): I am much indebted to Dr. Collins for his admirable discussion, and interested in his plan for a list of experts chosen by reason of knowledge and character. This plan does not differ very much from that which I suggested: that they should come from university faculties and hospital staffs, which, despite Dr. Jelliffe's doubts, would be apt to include a few good doctors and intelligent men.

I was also obliged to Dr. Starr for showing a plan to make experts expert and for demonstrating the indefatigability of our effort in this direction. It is something, I think, that we doctors keep on trying, however little encouragement we get from our results. It makes rather dreary reading to see that frankly dishonest reports are coming in to the Board of Education, and while it is not exactly germane, there is in it a certain moral analogy to our subject.

In reply to Dr. Osnato, I am glad to know that policemen used to be Freudian and now they are Behavioristic. While he said that New York State did not require any of these recommendations, he spoke rather of the criminal without resources; wealth can obstruct justice, and he admits that rich people are able to interfere with the administration of justice; and my remarks were really directed against our participating in that general abomination.

Judging from Dr. Jelliffe's emotional remarks, I would seem to have uncovered in him a maelstrom of courtly conditioned reflexes and pro expert complexes. To criticize the medical expert is not, I assure him, to besmirch the medical nest; but rather to try to cleanse the Aesculapian stables. I am sure that Dr. Jelliffe would wish to lend his eloquence and erudition to this good end, rather than to try to perpetuate a system which, while lucrative to a few, blemishes the reputation of us all, and threatens the safety and dignity of society as a whole.

SPECIAL REVIEW

THE BIOLOGY OF THE INTERSEX [1]

By Ben Karpman, M.D.

ST. ELIZABETHS HOSPITAL OF WASHINGTON, D. C.

Professor Goldschmidt has written a most fascinating book. Himself a tireless and brilliant worker in what until but a few years ago was a virgin soil, he shows us step by step what a rich and abundant harvest the work has yielded. To properly evaluate and correlate the immense material available was no mean task and in this the author has shown himself to possess not only a keen and penetrating insight, but as well a scientific fairness and broad familiarity with the subject which is quite exceptional. In a remarkably clear and vivid fashion he summarizes and brings up to date the results of investigation relating to the problem of Sex Determination. The scope of the work is much broader than the title alone would indicate. That this problem is of immediate import to biologists and medical men, to the latter mainly because it gives them such a large insight into the nature of many diseases, is obvious enough, but it should also prove of immense interest to workers in other fields both because of its purely scientific aspects, as well as because of its ultimate usefulness to mankind; for the problem in its practical aspects leads into the elucidation and probably actual control of sex. In particular it brings a significant message to the psychopathologist because it furnishes for once a thoroughly reliable and experimentally well established conception of bisexuality as a basis of animal organization, and also, because it presents us with an understanding of the biological aspects of sex abnormalities, which until now have received but scant consideration in the hands of psychopathologists. The significance of this study to psychopathological problems is not immediately apparent from the book—Professor Goldschmidt hardly touches the human aspect of it—but a proper appreciation of it may furnish the necessary stimulus for research among human material. The exceptionally fine and spirited translation by Professor Dakin, of Liverpool, enhances greatly the value of the book.

I

In the introductory chapter, Professor Goldschmidt discusses the general nature of sex and points out that permanent growth is impossible

[1] Goldschmidt, Richard. The Mechanism and Physiology of Sex Determination. Translated by Dakin, Wm. J. New York: George H. Doran Company, 1924.

unless the interpolation of a sexual process gives it a fresh start, thus indicating that the roots of the problem of growth are bound up with the problems of age, death and immortality.

Early in the evolutionary development—and this can even be seen in some of the simplest organisms—there may be observed a division of the body cells into two distinct groups. On the one hand we have the somatic cells, as muscles, nerve, gland, etc., which function for the whole body, their function necessarily leading them to death; and on the other hand, we have the sex cells which are not being used up physiologically during the life of the individual and, protected from the malignant results of metabolism, remain physiologically virginal thus surviving the rest of the body in its descendants. The sex cells, as a whole, have a different history from the somatic cells, the material for their constitution being set aside at the commencement of development; the separation of the germ cells is one of the earliest embryological events.

Although the asexual mode of reproduction is of quite frequent occurrence in the lower group of animals, especially in Protozoa, it is not by any means exclusive or universal. Indeed, there is scarcely an instance in the animal world of which we can say with certainty that its only means of reproduction is asexual. Early or late, there comes for all animal organisms a moment when a sexual act of some kind takes place. As a rule, it is a bisexual process; in some instances it is partherogenetic, or merely eliminative when an elimination of toxic products with a complete reorganization of the nucleus takes place.

But the significance of bisexuality lies in much more than merely to set agoing certain alterations in the ovum by the entering spermatozoa. Some of the evidence available suggests that bisexual reproduction exercises, perhaps, the most fundamental influence on the structure, function and behavior of the animal life and that the phenomena of bisexuality are intimately linked up with the nature of heredity and variation. What establishes particularly the essentially bisexual nature of living organisms is the rôle played by chromosomes. These, it appears, are bearers of Mendelian factors and the presence of an odd number of chromosomes in one sex and an even number of chromosomes in the opposite sex serves to maintain the bisexuality.

It having been established that each sex possesses the anlage of both sexes, it is necessary now to determine: What kind of a process is it which decides that of the two sex fundaments present in a bisexual organism only one normally develops? The answer to this and related problems Goldschmidt finds in the experimental and observational study of the phenomena of sex mixtures, that is, individuals which are mixed in sex (hermaphroditism, gynandromorphs, cockfeathered hens, etc.). Goldschmidt's own problem is concerned with the intersex, a particular form of sex mixture. He first notes that from the point of view of the determination of sex characters during the development of the indi-

vidual two large groups are to be distinguished in the animal kingdom. In the first group insects occupy a leading position and here, as far as we know, all that concerns sex is fixed with the event of fertilization so that castration or transplantation experiments are without any influence on the development of the secondary sexual characteristics. In contrast to insects we find that in birds, mammals and certain invertebrates, the interpolation of hormones is essential for the completion of the determination; and here castration and transplantation experiments have definite influence on the development or disappearance of secondary sex characters. As an illustration of the first type, Goldschmidt takes a species of insect known as Gypsy moth (Lymantria dispar) into which are included a large number of races and geographical varieties. In this moth, as in many other insects, the gonads are differentiated at an early larval stage, long before the external sexual differences, which are only visible in the winged adult, appear. These sexual differences include a difference in size (the females are considerably larger than the males), and a difference in color (the female's wings are white with dark, ill-defined bands, while the wings of the male are brown). Experiments performed on these have shown that neither castration alone nor combined with sex organ transplantation performed either late in development or even in early embryonic stages, exerted any influence whatever on the secondary sex characters, although the organs thus transplanted developed normally in the artificial situation. This shows with certainty that the sex organs and the somatic structures which are characteristic of the sex, can be completely independent one of the other.

Goldschmidt now summarizes the main results of his work on intersexuality. An intersexual moth usually arises when the male (or female) of one race of a certain species is crossed with a female (or male) of another race of the same species. These hybrids show a peculiar distribution of secondary sex characteristics in that alongside the characters of its own sex they show streaks and islands of the secondary sex characters of the opposite sex. The more distant the races are the greater is the degree of intexsexuality, so that in very extreme cases a stage is reached in which all the females are converted into males and this can be demonstrated embryologically. The experiments thus demonstrate clearly that animals are essentially bisexual and that both sexes are capable of developing the characters of the other sex when certain definite combinations of hereditary material which are not normal are brought about by crossing. Goldschmidt further states that the various organs of the body fall into a definite series as regards their development—and this series is exactly the opposite of the order of their embryonic differentiation. The organs which are first developed and differentiated, as for example, the reproductive organs, are obviously the last to be modified, while those which appear last are the first to be changed. According to Goldschmidt then, an intersex is an in-

dividual who has developed as a male (or female) up to a certain point; at this turning point a switch-over reaction takes place and the development continues in the direction of the opposite sex. The reason for the switch-over reaction is stated by Goldschmidt to depend on the relationship of something in the eggs (F) to something in the spermatozoa (M), which if disturbed leads to intersexuality; also that cytoplasmic influence plays a rôle here. Goldschmidt does not offer any specific explanation of the nature of the reaction which influences differentiation, but believes that enzyme-like action or hormonic influence is not unlikely.[2]

For purposes of clearer orientation it is necessary now to relate the phenomenon of intersexuality to another type of sex mixture, namely, gynandromorphism. We owe mainly to Morgan and his pupils a clearer appreciation of this subject.[3, 4, 5, 6] In its typical form the essential feature of gynandromorphism lies in the presence in an individual of one sex of sharply marked off parts of the body which bear the characters distinctive of the other sex. These differently sexed regions pertain mainly to somatic and secondary sexual characters, although the genitalia and even the gonads may be involved. Male and female characters may be combined in many different and diverse ways.

The genetic mechanism involved in the phenomena of gynandromorphism is interpreted by Morgan on a chromosomal basis and refers to some abnormalities in the X chromosomal mechanism—for instance, to the elimination of one of the X chromosomes, usually at some early division of the segmentation nuclei. Morgan believes that since he worked mainly with hybrid insects, the explanation can properly refer only to insects, but submits that there are good biological reasons to view human sex mixtures as mosaics, rather than hermaphroditic, in which there is a local replacement of parts of one sex by parts of another. Goldschmidt, on the other hand, is inclined to look upon human sex mixtures as expressions of intersexuality, but that seems hardly possible as these conditions (hermaphroditism and pseudo-hermaphroditism) could not conform to his own definition of intersexuality—starting as one sex and finishing as the other sex. Intersexuality, in the sense of Goldschmidit, probably exists among humans but perhaps of a different order (homosexuality?). It is obvious that this is virtually a virgin field which would repay the best efforts of the biologist, anthropologist and psychopathologist.

[2] See also Goldschmidt, R. "A Further Contribution to the Theory of Sex." Journal of Exper. Zoölogy, Vol. 22, No. 3, 1917, pp. 597–598.

[3] Morgan, Th. H. et al. "Contribution to the Genetics of Drosophila Melanogaster." 1. The Origin of Gynandromorphs. Carnegie Inst. Pub. 278.

[4] Morgan, Th. H. et al. "The Mechanism of Mendelian Heredity." Henry Holt & Co., New York, 1923.

[5] Morgan, Th. H. "Mosaics and Gynandromorphs in Drosophila." Proc. Soc. Exp. Biol. and Med., XI.

[6] Sturtevant, A. E. "Experiments on Sex Recognition and the Problem of Sexual Selection in Drosophila." Journal of Animal Behavior, V.

Goldschmidt is at pains to make a clear cut differentiation between intersexuality and other types of sex mixtures, more particularly gynandromorphism. A gynandromorph is a sex mosaic in space in which male and female parts lie, from the point of view of the physiology of development, adjacent to each other; they are present simultaneously during development. It is essentially a product of a disturbance in the mechanism of sex distribution, due to abnormal cytological conditions which, once established, transmit to the descendant of some cells the chromosomes combination of one sex and to others that of the other sex. Should the gonads develop from two such groups of cells, an hermaphroditic condition will result. An intersex, on the other hand, is an animal which genetically belongs to one particular sex, male or female, but which at some stage of its development, through physiological or genetic causes, had its course changed in the direction of the opposite sex. In contrast to the gynandromorph which is a sex mosaic in space, an intersex is a sex mosaic in time, male and female parts lying perhaps side by side, but from the point of view of development one is younger than the other, *i.e.*, at a given time during the development the whole individual is of one sex, while at a later time it is entirely of the other sex. It is fundamentally a product of a disturbance in the physiology of sex determination. Hence, certain stages in an intersexual may fall under the term hermaphroditism.

Not all workers in the field would agree entirely with Goldschmidt's interpretation. Morgan,[7] in discussing the problem, offers rather serious objections to Goldschmidt's interpretation of the results. Admitting that there is some evidence which suggests a cytoplasmic influence, he argues that there is also evidence that there are differences in the maternal chromosomes concerned, which with equal justice could be called "factors for femaleness." The numerical data assigned by Goldschmidt to the opposing factors for maleness, and femaleness, M and F, are arbitrary and are not yet based on any established quantitative work. As for the results depending on male and female producing enzymes, while admittedly many of the changes in embryonic and larval development might be due to enzymes, there is no reason to suppose that the relative concentration should change in the course of development as Goldschmidt must assume that it does; and how the enzyme starting with a lower concentration always manages to overtake the one with a higher concentration, is not at all clear.

The above conceptions hold fairly generally for higher animals in whom hormonic influence is at work. Here Goldschmidt summarizes the work of other workers in the field and looks upon the various sex-mixtures due to hormonic disturbance, as being but certain types or manifestations of intersexuality. It is very doubtful, however, whether it is scientifically valid to look upon hormonic sex-mixtures in the same

[7] Morgan, Th. H. Op. cit., I, pp. 87–91.

light as zygotic sex-mixtures; for we are obviously dealing here with quite different phenomena, as Goldschmidt himself admits. With equal justice Morgan could speak of all hormonic sex-mixtures as variations of the same problem, namely gynandromorphism; yet he is rather too careful about it. The reader is, therefore, cautioned not to be carried away too far by Goldschmidt's enthusiasm which, to some extent, blinds him to other possibilities.

Castration in the Mammalia results in a cessation of the normal development of the secondary sexual characters. The specific hormones are, therefore, necessary for their complete development. Their absence, however, does not as a rule, bring about the development of the secondary sex characters of the opposite sex. If, in addition to castration, transplantation of ovaries into male animals is also effected, certain other results are obtained. The male organs which had already been differentiated, cease further to develop or retrograde, whilst organs which could continue their growth in modified form develop in the female direction and in the end become altogether female in character—as regards form, weight, skeleton, character of the hair, mammary glands, secretion of milk, and even behavior. Corresponding changes are also observed in castrated females who, with transplanted testes, take on male development. In other words, the presence of the hormones of the opposite sex causes the further development to follow in the direction of that sex, and, so far as is morphogenetically possible, makes the individual intersexual, or rather mixed in sex.

Besides experimental work we have suggestive evidence from sex-mixture phenomena that are of wide occurrence in nature. In the varieties of twin births in cattle, there are sometimes observed instances when one of the twins is a normal male, and the other a sexually abnormal calf—so-called "free-martin." The free-martin is usually female in its external sex characters and more male internally. Now, all investigations show that, genetically, the "free-martin" is a female arising from a different egg. What, then, causes the female calf twin to become intersexual? Embryological investigation gives a clear answer to the question. Whereas, in all normal cases of twins of different sexes, there is no connection between the two embryonic circulations, in a few cases a common chorion is formed with anastomosis of the two blood systems and the consequent circulation of the blood of one through the other. If, at this early stage, the testes of the male twin produce hormones which determine male differentiation, they can enter the female embryo by way of the blood stream and thus induce intersexuality. But, it may be asked: Why is it that the female and not the male becomes intersexual since the same blood runs through each? According to F. R. Lillie,[8]

[8] Lillie, F. R. The Freemartin. Journal Exp. Zoöl., 23, 1917.

this is due to the fact that the testis differentiates histologically earlier than the ovary and hence its hormones, working from an earlier stage, actually repress ovarian action.

As bearing on the same problem, we have the chromosome distribution in man. It is probable that there are at least two, if not more, types of sperm produced. The sex-linked inheritance of certain defects, such as hemophilia, color-blindness, etc., appear to depend on the relations of male and female chromosomes. Further data of considerable significance to medicine are contributed by studies relating to disturbances in the function of chromosomes. Some twenty years ago, Boveri working on mitosis and the development of sea-urchin larvae from double-fertilized eggs, was impressed by the remarkable similarity between the pathologic pictures in these cells and those observed in human cancer tissue and suggested that in the nuclei of these cells as in those of cancerous tissue the numerical relations of the chromosomes have been disturbed. The suggestion has somehow never been taken up by students of cancer, but it is a highly significant one and once more emphasizes that every pathology is fundamentally cellular pathology.[9]

II.

As regards human conditions relating to the different types of sex-mixtures, we find that they agree substantially with the results obtained by experiments and observations on animals. The material is gathered mainly from castrations, which have been carried out for religious, medical and other reasons, and from the study of natural sex-mixtures, as they spontaneously occur among humans. The most detailed investigation of the former has been carried out by Tandler and Grosz, who investigated the Russian castrated sect, Skoptzi. The various anatomical changes that follow such castration is interpreted by these investigators, as meaning that castration does not call forth the characters of the opposite sex, but only a standstill at a stage of immaturity; in other words, the production of an asexual form. With this arrested development and failure of differentiation, growth, however, is not checked. Thus the tendency of the castrate is to converge to a common species type, with characters essentially similar, and the changes incident upon castration are, rightly, regarded by them to be species character. With this interpretation, however, Goldschmidt does not agree. He thinks that a closer analysis of the situation reveals that we are dealing here with a moderate form of intersexuality. He argues that intersexuality, as a result of castration, is only possible for those organs which develop after the operation and, therefore, still capable of differentiation; we should therefore expect that these should be female in type. This, he thinks, is really the case. He believes that if we exclude the regional fat deposits, which may be related

[9] See also Metcalf, M. M. Journal A. M. A., April 11, 1925, Vol. 84, p. 1140.

to other metabolic conditions, we have here the pubic hair covering, which differentiates after castration, and is female in type; the beard developing is also of the female type. Here again one feels that Goldschmidt is overstressing his point, for, as already stated, castration in mammals without transplantation (and this is the case with human castrates) results in cessation of the normal development of secondary sex-characters, but does not, however, lead to the development of those of the opposite sex.

As for natural human sex-mixtures, Goldschmidt would regard them all as expressions of intersexuality. These sex-mixtures are generally spoken of as pseudo-hermaphroditism, of which the anatomists distinguish two types, viz.: femininus and masculinus. These include a great variety of conditions in which, as regards inner and outer genitalia, every possible intermediate stage between the two sexes is found; from individuals externally male and internally containing ovaries, Mullerian and Wolffian ducts, to the other extreme of individuals, externally female, with internally fully developed testes, etc. The other type of sex-mixture, which Goldschmidt only mentions in passing, is that of homosexuality, and this, too, he regards as a stage of intersexuality. Here he is obviously not on very sure grounds, and vigorous objection might well be raised against it; for there is, as yet, no experimental proof of it, and, in the nature of things, such proof would be very difficult, if not impossible to obtain.

Elsewhere Goldschmidt[10] indulges in a little speculation on the possibilities of the problem, stating, with Moll, that homosexuality must be looked upon not as a disease but as an anomaly—a biologic variation that, perhaps, resulted through incomplete sexual differentiation. He argues that, if it is permissible to regard homosexuality as a genetic condition (since the general laws of heredity are the same for plants and animals, lower and higher) it would be justifiable then to look upon homosexuality as but a biological expression of intersexuality and analogous to butterfly experiments; bearing in mind, of course, the action of hormones in man, and, further, that in the buterflies, the female is heterozygous, while in humans, it is the male that is heterozygous. But, if homosexuality is biologically conditioned, the question arises: What are the abnormal factors that are responsible for its manifestations? If the Gypsy moth can have such marked differences between its many races, so marked, in fact, that their crossings produce various types of abnormalities such as intersexuality and sterility—may not the humans, also, present among themselves a variety of organic types which are only compatible within certain limits? We do not, of course, refer to the races in the sense generally accepted—white, yellow, negro, etc., for human races are greatly mixed, and it is not stated or proven anywhere,

[10] Goldschmidt, R. Die Biologische Grundlagen der Intersexualitat und des Hermaphroditismus beim Menschen. Arch. Rassen u. Gesellsch. Biol. Vol. XII, 1916.

that various human racial crossings produce a progeny that is abnormal in the sense of intersexuality, homosexuality, or sterility; but we refer here to the existence of certain anatomical types, perhaps, in some such sense as that of Kretschmer, Draper, Tandler, and others. Admittedly, there may exist various organic and functional incompatibilities between the mates, or inherited mutations within the folds of the family. Then, we also have the possibility of hormonic disturbance, which may be conceived as having several aspects; some hormonic disturbances may be essentially functional in nature and, not unlikely, also due to psychogenic influences. It is obvious that we are dealing here with a multiplicity of factors to disentangle which is no small task. Psychopathology is yet to find its answer for the biology of human homosexuality. These, and similar problems, are of importance to medicine, and still await their final solution.

To sum up, we have in this work of Goldschmidt a vivid illustration of the fundamental service which biological research contributes to the solution of many human problems. Through its experiments and observations on animals, it throws into a suggestive relief the problem of human sex-mixtures, including homosexuality; an understanding of the disturbances in the relations of chromosomes, as observed in lower animals, sheds a new light on the nature of a cancer, while a proper appreciation of the distribution of male and female chromosomes and their relation to each other, puts the problem of heredity in an altogether different light. And it also gives us a significant clue as to the possibilities for voluntary control of sex. But biology contributes more than that. In the light of biology, the entire problem of sex acquires a new meaning: for, whereas, we ordinarily think of sex as only referring to sexual appetite and mating, the biologist emphasizes the multiform processes that precede mating—the distribution and relation of the chromosomes in heredity and variation, the meaning of bisexual constitution, etc. It further emphasizes the tremendous, one would say, exceptional rôle that sex plays in all biological processes. Here is material that would bring joy to the home of the Freudian. For it appears that sex not only plays an important rôle in all life processes, but, indeed, plays the rôle par excellence; it pervades and permeates all life reactions; even, perhaps, that animals eat in order to reproduce, and the mortal soma exists for the sake of the immortal germ-plasm. Parasite-like, the sex cells take no active part in other functions of the body beyond their own metabolism, but live on the work and labor of the soma, that eventually dies from exhaustion. But with the death of the soma, the germ cells continue to live—forming a material bridge between the generations, links in a continuity which is theoretically unlimited, and, in this sense, they are immortal. There thus seems to be something of an antithesis between personal and racial existence, death and life, between what we please to call the ego and sex drives. Again, such antithesis may well be only apparent, for as Weismann said: "There is nothing in the results of biology which would indicate that

physical death is a necessity; it is rather an adaptation. When at length, the body becomes unfit, it acquires through reproduction a new body; it is, therefore, in the best interests of the race that there should be death. . . . Life and death are concomitant phenomena and not antithetic but mutually complementary to the logical sequence of things." So Der Totentanz bekommt Ein Lebentanz. Here is a field with a message of its own, pregnant with tremendous possibilities for the psychopathologist, as yet barely touched, and still awaiting many hands and many heads to help its solution.

Book Reviews

Schaffer, Karl. Ueber das morphologische Wesen und die Histopathologie der hereditaer systematischen Nervenkrankheiten. Julius Springer, Berlin. 18 marks.

Prof. Karl Schaffer, OÖ. Professor of Psychiatry and Neurology of the Budapest University, has occupied himself more or less intensely with the heredodegenerations of the nervous system for the past twenty-five years. It is about that time—1902—that his contribution to amaurotic family idiocy was made, and since then a score or more studies have shown sincere, painstaking, and thorough grasp of the problems, with particular emphasis laid upon structural correlations.

Not only have the heredodegenerations clinical-biological relationships, but Schaffer maintains that histopathologically there is warrant in grouping them as a unity. At the Innsbrück meeting of the German neurologists (1924), Schaffer presented his material as a general "referat." This he has revised and brought to date and in this No. 46 of the Springer Monograph Series presented his present day summary of his ideas with the evidence.

Schaffer adheres to the Jendrassik generalization that the heredodegenerations may be considered globally as a group, and the present monograph attempts to make an anatomical classification of the entire material. Thus he divides it into three subgroups: (1) Those in which Motor Phenomena prevail, dependent upon (a) Pyramidal Heredodegenerations, (b) Extrapyramidal Heredogenerations, (c) Amyotrophic Heredodegenerations; (2) those of Sensory Significance, (a) Spinal Heredoataxias, (b) Cerebellar Heredoataxias; and (3) Associated Forms, (a) Early Type of Familial Idiocy and (b) Late Types of Familial Idiocy.

In general, Schaffer is sympathetic to the Mendelian conceptions. Whereas in many instances the complete criteria are lacking, still the general situation is such as to permit the use of the generalizations.

Can the histopathological picture be utilized in furthering a more workable systematization of the whole group? This question Schaffer answers in the affirmative and devotes the 250 pages of this most valuable monograph to its elucidation. His early work upon the amaurotic family idiocies gave him the impulse towards this systematization and he has followed it up throughout the group as far as it was possible with the clinico-pathological material at his disposal. As early as 1914 his attention was focussed upon embryonal factors, and in an elective ectodermal involvement he has sought to work his way through to a general outlining of the heredodegenerative processes. He outlines very clearly the histopathological trends that

result from such involvements and traces his own modifications of views, as outlined in some papers published in 1918 and 1922, in which the work of Sachs, showing cortical arrested development, was of importance. From these considerations sprang his study of macro-micro degeneration stigmata, influenced by the work of Retzius, Brodmann, Elliot Smith, and others, which were carried into the cytological field with fine discriminate capacity.

Thus he develops the broad conception that the heredodegenerations are evidences of developmentally determined diseases of the nervous system, not only clinically and hereditarily, but macroscopically and microscopically set apart from other affections of the human organism.

These factors, as well as those of exogenic moment, intoxications, intercurrent disease, etc., are elaborated at great length in this well worth production, which no review could adequately summarize, much less find fault with. It should be read by all interested in the field, and where is the clinician who does not find abundant material in his consulting room?

Platt, Charles. The Riddle of Society. [E. P. Dutton & Company, New York.]

This author has already given us studies upon the Psychology of Thought and Feeling and the Psychology of Social Life, and here enters into what is wrong with the social scheme of things in that there are malefactors a plenty, why and what is to be done about it.

Certainly with every newspaper spattered over with robbery and murder and no one going about without a bunch of keys—a sure index of a dishonest crowd—something is wrong—trite as this is said either of Denmark and everywhere else.

The author enters into all this. He says that all we need are a few fundamental concepts—he purposes to demonstrate them. We have not been able to find them. Instead, we find a very readable, rather light mousse of pleasing essays which, as an introduction to the problems involved, will be found quite acceptable.

Levine, Israel. Das Unbewüsste. Authorized Translation by Anna Freud. [Internationaler Psychoanalytischer Verlag, Leipzig, Wien, Zurich.]

It is a rare compliment for a psychoanalytic work to be translated into the language of its originators, but this work of Levine's upon the "unconscious" merits this attention. We have already spoken of it, as it appeared from the Macmillan press. It is a very sound and valuable book.

Maier, Hans W. Der Kokainismus. [Georg Thieme, Leipzig. 15 marks.]

A 269-page monograph, the most complete with which we are acquainted, dealing with acute and chronic cocaine taking. The

whole is seen chiefly through the eyes of a psychiatrist, Dr. Maier being first assistant in Bleuler's Clinic at Burgholzli, Zurich.

The various pathological phases of delusional formation, hallucinations, and antisocial conduct are excellently portrayed from a foundation that is analytic in the best sense as well as more formally psychiatric.

As has been known for years, withdrawal is a comparatively innocuous procedure, but to prevent relapses is not so easy. Combined morphinism and cocainism is a particularly severe situation. The mental deterioration here observed is of rapid development.

Social efforts at control are suggested through governmental supervision. How inadequate and even farcical such efforts are, and will be for centuries to come in the United States, can be easily read in the light of the Prohibition farce—not to mention the widespread use of cocaine in the United States.

The monograph is most excellent.

Train, Arthur. THE BLIND GODDESS. [Charles Scribner's Sons, New York. $2.00.]

As one looks at the mural decorations of the Criminal Court building, not in New York City but in many another, the blindfolded, white robed figure of Justice stands out in bold relief among innumerable other symbolic representations. Our New York goddess cannot be permitted to be blindfolded. As the layman listens to the legal procedure from time to time and notes its practical efficiency, no doubt the query often arises as to the significance of this blindfolding mechanism. Ideally representing "no favorites," practically it seems to foreshadow, and that not infrequently, stupidity.

Thus, when a well known criminal lawyer would deal with the situation of the "Blind Goddess," we cannot help but pause and read what he has to say, especially as it is fashioned in a fascinating form and gets to grips with real situations.

We cannot tell what this delightful novel has to say, but we can say—by all means read it. It is worth much more than many a ponderous medico-legal tome even though it may be a trifle Arrowsmithian.

Bassoe, Peter. NERVOUS AND MENTAL DISEASE. Vol. VIII. Series 1925. Chicago Year Book.

The summary of the neuropsychiatric literature of 1925 appears this year as creditable as those of former years, and the English speaking public are fortunate in having this well digested series of abstracts. The editor's well seasoned comments add not a little to the value of the volume.

Thomson, J. Arthur. CONCERNING EVOLUTION. [Yale University Press, New Haven. $2.50.]

This interesting volume, neither too large in scope as to require a summer's vacation to read, nor yet so condensed as to falsify the

essential features of a highly intricate subject, comes to us as a series of lectures of the Dwight Harrison Terry Foundation, the object of which is to aid in the building up of a broadened and purified religion through all of the agencies of science and philosophy.

The deliverer of the lectures, Professor of Natural History in the University of Aberdeen, has acquitted himself well in the principles of the foundation, and written a most fascinating book upon evolution, not for the expert but for everybody.

Steiner, Max. Die psychischen Störungen der männlichen Potenz. Dritte Auflage. [Franz Deuticke, Leipzig u. Wien.]

To this small monograph of sixty pages Freud contributes an Introduction. In it he states that the author was one of the first specialists working in another field to recognize the significance of psychoanalysis in his specialty and after serious work has maintained throughout his original attitude, and he adds a paragraph or two about the advisability of the specialist, no matter what his field, knowing something about the "nervous" functioning of his organ. When Dejerine, after forty years of close observation in all fields, came to the conclusion that nearly 80 per cent of the polyclinic patients had "false cardiopathies," "false gastropathies," "false enteropathies," etc., meaning that a neurosis was hidden behind what the various special workers had called organic disease of the respective viscera, the Paris physicians pronounced him "anathema." But subsequent experience has shown the general truth of his point of view—even if for different mileux the percentages may vary somewhat.

This makes the present work of interest, for here are numerous neurotic patients in whom "impotency" is the organ manifestation. Experience is showing that most impotency is psychogenic in origin. It exists in both sexes. It manifests itself by frigidity, as well as by nymphomania in the female, and loss of erection, premature ejaculation, and inability to ejaculate in the male, with a host of intermediary phenomena. As we know, not only from Stekel's works but from many another, the celebrated lovers, the Don Juans of the world, are usually impotent.

It is of service, this little book, not to the genitourinary specialist alone, but for all physicians; for the principles here expounded apply in many other fields.

Kleist, K. Episodische Dämmerzustände. [Georg Thieme, Verlag, Leipzig. 3.60 marks.]

Professor Kleist of Frankfort presents here, in a short monograph of about eighty octavo pages, a very intense and clear descriptive study of episodic dreamy states. He points out that when Kraepelin finally rounded out his conceptions of the two types of constitutionally founded psychotic manifestations, namely dementia precox and manic-depressive psychoses, clinical psychiatry was left, as it were, in the stocks, and exhausted itself in unfruitful efforts at determining the clinical boundaries, on the one hand to limit the

extensions of the conception, and on the other to widen them. Naturally criticisms came from many sides, those of Hoche being prominent. No progress could be made until new data could be assembled and new viewpoints constructed. These followed when Sieffert, Bonhöffer, and Rüdin worked with the reactive psychogenic disorders of psychopaths. Then Bonhöffer cleared up a niche in the precox area in his delineation of the symptomatic psychoses; Kleist in his involution paranoia, and others separated some of the presenile states from the precox-manic magma and thus the process goes on.

Kleist calls attention to his separation of an autochthonous constitutional psychosis, along Wernickean lines, from the same heap, and in the present monograph would try to clear up the symptomatic expression, heretofore generalized as the dämmerzustände—dreamy states, twilight states, etc.

From the standpoint of a series of structural system degeneration possibilities, too broadly classed as "degenerative psychoses" by Schroeder, Kleist believed some advance may be made, there were treasures here to be unearthed. Thus his migraine psychoses, some narcolepsies, episodic depressions, and instinct compulsions in psychopaths. To these he would here add a series of episodic twilight states not related to any so-called epileptic etiology, yet clinically often closely resembling.

The present pamphlet describes nine cases, arranged as Simple, Hallucinatory, Expansive, Irresponsible, and Psychomotor twilight psychotic states. The general features are then discussed. The general mold is purely descriptive: Constitution with a capital C provides all the etiological requirements, with Heredity crouching in the background. Motivation or Purpose, as understood by the Freudians, and which threatens the old descriptive rubrics, is not mentioned.

The monograph is excellent, since it shows how little we still know about the dämmerzustände and of value as an effort to sort out possible structural mechanisms, a point upon which it is frequently forgotten Freud has always insisted. For Freud such mechanisms are conceived of as functionally synthesized for carrying out definite purposes; for the bulk of psychiatrists the mechanisms are of purely anatomical import. The latter want to see the blueprint of the New York Central Railway—and thus locate any trouble; Freud was more interested in the purpose that led the passenger to take this or that railway and not the picture of the tracks—both visions of course being desirable—ultimately to be synthesized, as Schilder in his recent Entwurf is attempting.

Jaspers, Karl. Psychologie der Weltanschauungen. Dritte Auflage. [Julius Springer, Berlin.]

A third edition, unmodified since the second. It is a large work of nearly 500 pages, each page itself being full-size octavo. The work is divided into three sections, with an Introduction of fifty pages and an Appendix of about the same. The first section deals with the Situation—Einstellung—where-are-we-at sort of material.

Active, contemplative and mystical attitudes are distinguished. The formal descriptive and the relative and moving systems are discussed. The ideas of Plato, Eckhart, Spinoza, Kant, Schopenhauer, and Hegel are all entered into as contemplative aspects of the Einstellung. These with the mystic forms constitute an environmental reactivity. Then the introspective attitudes are dealt with, and finally the author has an enthusiastic attitude or Einstellung of which the symbol is love. In the second chapter the "World Picture" is looked over. Here also we have an introduction, a sensory space world, a psychical cultural world, and a metaphysical world. Section III deals with the "Life of the Spirit"—with introductory remarks, then Scepticism and Nihilism, the Limits of the Confined; The Gehaüse, the Limits of the Eternal: The spirit is eternal and free. This chapter ends with a section upon the Mystic.

This offers the barest of ideas of the scaffolding of this extremely complicated work. By the psychology of the "Weltanschauung" the author means something different from a prophetic philosophy, the which is his term for philosophies in general, since they would be sufficiently generalized to explain everything and hence are prophetic in function. In Hegel's Phenomenology of the Spirit the author finds the first indication of this particular field, and in Kant's conceptions of the "Idea" the complete ground plan upon which he would build.

It is an interesting structure that he has reared. One looks it over with puckered brows, at times wondering what may be the applications for daily life, since we had the preconception that a psychology of the principles of a universal word grasp should have practical application, for any or every situation in life, even though it were some one situation abstracted from the whole.

On the whole a work to be read and enjoyed, as it offers much material. We find it a trifle dogmatic here and there; relativity is not overlooked but is soon glossed over. The so-so-ness from an absolutistic point of view shows through as a skeleton upon which a distinctly attractive series of garments is draped.

Obituary

DR. CHARLES HERMAN CLARK

Dr. Charles Herman Clark died at his home at the Lima State Hospital, Lima, Ohio, on November 15, 1926. Dr. Clark had not been in good health for some time having been a sufferer from arterial hypertension and renal complications, including albuminuric retinitis, but his passing came rather unexpectedly.

Dr. Clark was born on a farm near Mechanicsburg, Ohio, in 1866. His education was obtained in the schools of his native county and the Starling Medical College of Columbus, Ohio, where he graduated in 1893. After an interneship in St. Francis Hospital, Columbus, he became Assistant Physician at the newly opened Ohio Hospital for Epileptics at Gallipolis, Ohio, under the Superintendency of Dr. H. C. Rutter. In 1895 he was transferred to the Columbus State Hospital where he served under the late Dr. A. B. Richardson. In 1898 Dr. Richardson was sent to open the recently constructed Massillon State Hospital and Dr. Clark was transferred with him to Massillon. In 1899 Dr. Richardson became Superintendent of St. Elizabeths Hospital, Washington, D. C., and Dr. Clark again accompanied him to his new field. Following Dr. Richardson's death, Dr. Clark continued on the resident staff of St. Elizabeths Hospital under the Superintendency of Dr. William A. White until 1907, when he was recalled to Ohio to become Superintendent of the Cleveland State Hospital. As the Medical Director of this institution, he displayed marked executive ability. In 1914 he was called upon to assume the Superintendency of the newly constructed Lima State Hospital for the criminal insane, which position he filled with recognized success until his death.

Dr. Clark was a member of the American Psychiatric Association and of his County Medical Society, the Ohio State Medical Association and the American Medical Association. For many years he had been active in American Psychiatric Association affairs and since 1924 had been a councillor of this organization. While not a voluminous writer he was the author of many excellent papers upon psychiatric subjects. As a preceptor and developer of young

men he was preëminent. Three of his former assistants are now superintendents of State Hospitals in Ohio.

For thirty-three years Dr. Clark served continuously in the State Hospitals of Ohio and the Government Hospital at Washington. He was a psychiatrist of outstanding reputation in Ohio, esteemed not only for his skill in mental and nervous disorders, but for his fine personality, his high ideals and sterling character and his useful citizenship. He is survived by his wife and daughter who make their home in Lima.

Wm. H. Pritchard, M.D.

N. B.—All business communications should be made to Journal of Nervous and Mental Disease, 64 West 56th St., New York.

All editorial communications should be made to Dr. Smith Ely Jelliffe, Managing Editor, 64 West 56th St., New York.

Vol. 65 APRIL, 1927 No. 4

The Journal

OF

Nervous and Mental Disease

An American Journal of Neuropsychiatry, Founded in 1874

Original Articles

THE SYNDROME OF MENTAL AUTOMATISM AND ITS RÔLE IN THE FORMATION OF THE CHRONIC SYSTEMATIZED PSYCHOSES: A REVIEW *

By Percival Bailey, M.D., Ph.D.

ANCIEN ASSISTANT ÉTRANGER DE LA FACULTÉ DE MÉDECINE DE PARIS; CLINIQUE DES MALADIES MENTALES

Introduction

This review has for its object to attempt a systematic exposition of the phenomena grouped by G. G. de Clérambault under the title of *syndrome of mental automatism* (syndrome of passivity, syndrome of interposition), together with his views of the rôle which they play in the development of the chronic systematized psychoses (paraphrenia and paranoia). de Clérambault is one of the most original and picturesque figures in the modern psychiatric world in France,

* Read before the Boston Society of Psychiatry and Neurology, Dec. 16, 1926.

but his views on this and other subjects have not been systematically exposed but are to be found widely scattered in obscure French publications not likely to circulate in this country. They have nevertheless attracted considerable attention and seem to me to be of sufficient originality to merit this study. The phenomena in question have been known of long date. The interest in de Clérambault's conception of them lies in his insistence that they have a common origin, that they are due to an organic lesion of the central nervous system and that they constitute the basal factor in the provocation of many systematized psychoses.

The author has studied all of M. de Clérambault's publications on this subject; has regularly followed his conferences at the *Infirmerie Spéciale de la Préfecture de Police de Paris,* and will attempt to set down faithfully his conceptions, but it is of course understood that M. de Clérambault is in no wise responsible for any lack of understanding on the part of his auditor since this manuscript has not been submitted to him for correction although he knows and approves of its publication.

Syndrome of Mental Automatism

M. de Clérambault is not satisfied with the term "mental automatism" and has from time to time employed others, such as syndrome of interposition, syndrome of irradiation, syndrome of passivity, syndrome of interference, syndrome of parasitism, etc., without making a final choice. At any rate the automatism is a triple one, comprising phenomena of three sorts (a) sensory, (b) motor, and (c) ideoverbal. It includes all of the processes described under the name of hallucinations but is more comprehensive than this term and includes many illusions and other phenomena which will be described in detail, many of a negative character. It is moreover difficult to establish sharp distinctions between these different symptoms; for many an illusion is a hallucination whose point of departure is obvious and a hallucination is an illusion whose point of departure is latent (Séglas).

a. *Sensory automatism.*—It is unnecessary here to attempt a complete exposition of sensory hallucinations and illusions. It will suffice to note their characteristics as they occur in the chronic systematized psychoses.

First and foremost are the auditory hallucinations which are rarely absent. It used to be considered that they were a fundamental and predominant feature of the chronic hallucinatory psychoses but the work of later years has shown that the predominant feature is

the ideoverbal automatism to be described later. This fact was remarked by Lugaro long ago. Auditory hallucinations are frequent, nevertheless, and vary from the most imprecise, resembling a simple memory, to the most complete objectivation. Although they are usually in the later stages verbal (phonèmes) in the beginning they are often non-verbal (akoasmes) and vary through the whole range of auditory complication from brute noises, and differentiated sounds—cries of animals, sputtering of electricity—to syllabic hash (jeux syllabiques), salads of words (kyrielles de mots), nonsensical expressions (non-sens), even to the most complete words, phrases and conversations.

The content of the verbal auditory hallucinations is most variable and by no means always hostile. It may in the beginning be entirely neutral and greatly surprise, astonish and even amuse the patient, because it is so absurd and alien to his personality. The content may be even flattering and quite agreeable. Any stimulus may increase these hallucinations and they multiply especially under the influence of emotion.

Hallucinations or illusions of the general or visceral sensibility (coenesthésie) are also frequent. The patients complain that their head is held in a vise, that their uterus is displaced, that their bladder is ingeniously distended, etc. A special type of hallucination of the general sensibility is found in the genital hallucinations. It is not meant here those tactile and coenesthetic hallucinations in the genital region which the patients express by saying "They compress my organs" or "They withdraw my sperm through the meatus," but actual voluptuous impressions with excitation and ejaculation. Such hallucinations seem to be especially common in old maids.

Hallucinations of taste and odor are not rare and are usually of a disagreeable character described as that of sulphur, of burning rubber, etc. The patients usually refer to them by an interpretation saying "They put phosphorus in my soup." "They send foul gases into my bedroom," etc. Occasionally the odor is agreeable, like that of incense or perfumes and the taste "like that of the manna from heaven."

Cutaneous hallucinations are rare and may give an impression of heat, of cold, more often of touch and usually of pain. "They pinch my legs," "They stick needles into me through the bed clothes," are expressions employed. Although the patients often complain bitterly, it is rare that these impressions give rise to any motor response similar to the listening attitude adopted by the subject of auditory hallucinations, but Chaslin describes a girl who several times

during the examination jumped, cried " Outch " and claimed it was because someone had pricked her with a needle. The cutaneous impressions may also be agreeable, resembling caresses, especially in female subjects and are often associated with genital hallucinations.

Visual hallucinations are not so common as auditory and coenesthetic ones but are more common than usually supposed and vary from the most elementary kaleidoscopic color play to the most complete visual pictures, even verbal. They have no relation to the course of thought of the patient; have often no relation among themselves; carry no affective charge and are independent of the auditory hallucinations. One patient described them as " free images." They are usually flat, airy and transparent. They are seen as pictures and not as realities. The patients say " They make me see pictures," " They show me a cinema."

b. *Motor automatism.* — Here are collected the phenomena described by Séglas in 1888 under the name of motor hallucinations. They are hallucinations of the kinesthetic sensibility, especially of the vocal musculature. They may be either partial and indeterminate as in the case of the young girl who complained that her arm was continually moving, or partial and differentiated when the patients complain that they have a sensation of walking, jumping, taking hold of an object, bending the leg. More generalized hallucinations of this kind result in complaints that they are shaken in bed, forced to fly through the air, feel that they are pushed and directed.

Much more common are the verbal motor hallucinations. The patients insist that they do not hear speaking, but that they feel it. " They move my tongue "; " They force me to speak "; " They speak with my voice "; " My tongue falls into step with the thoughts of others "; " There is something which speaks when it wishes."

These phenomena may or may not be accompanied by visible movement of the speech musculature, and may even extend to the actual ejaculation of words, the so-called verbal impulsions. The patients complain that they are forced to say words they do not wish to say and that are contrary to their thoughts (logokinésie of Kramer, onomatomanie, coprolalie, écholalie).

When the motor hallucinations are mild the patients can stop them by talking or by reading aloud, but when they are more intense the patient is unable to speak during these motor verbal hallucinations, the final motor pathway being unable to transmit at once two contradictory impulses (Sticker). Some patients complain that they cannot think without having the sensation of speaking. Others

accuse internal voices—movements that take place inside them, they say. At a more advanced stage they say "the words are formed in my mouth."

Verbal motor hallucinations may be combined with auditory hallucinations in variable degree or may be entirely independent.

Closely allied are certain impressions which may be described as emotional hallucinations. The patients experience as phenomena imposed upon them gaiety, sadness, anxiety, astonishment, anger. "Why do they cause me to be angry?" said one patient. "I am suddenly gay without cause" said another.

c. *Psychic (ideoverbal) automatism.*—These phenomena allied to the psychic hallucinations of Baillarger or the pseudohallucinations of Kandinsky are considered by M. de Clérambault of the utmost importance and often precede and predominate over even the auditory hallucinations, properly speaking. They are either positive or negative. The positive phenomena include:

1. Psychic hallucination. Thought is emancipated either undifferentiated or entirely mute. There is no exteriority. It is a sort of abstract intuition. The patients express what they experience by saying: "It is as if one were speaking to himself but without moving his lips"; "They make me understand mentally—by inspiration, by the spirit." Some call it "an interior voice," "the voice of the conscience." "They speak to me inside my head," "I do not hear their voices."

2. Ideorrhea (idéorrhée). A succession of thoughts passes through the patient's head which he cannot control and to which he does not wish to pay attention. "They make me think without rest."

3. Mute procession of the past (dévidage des souvenirs). This phenomenon may be appreciated from the statements of the patients. "They show me all of my memories." "They make me see my past." "They present for my consideration historical images."

4. Substitution of thought. Perpetually a foreign idea is substituted in the course of thought. The subject can only begin to think. "Always something comes contrary to my idea." "They give me that habitude of always thinking to the side of what I should think." "I suffer from a double thought."

5. Pressure of thought (aprosexie). The typical formula applied by the patients is "I know not where to find my thought in all that is wafted to me." They say also "My thought is always dispersed"; "I can only think of too many things"; "My ideas come too fast." Every effort of attention only makes things worse; there is then a veritable swarm of ideas.

6. False recognition, false resemblance and sentiment of strangeness. "They make me recognize people." "People have a strange unreal appearance." These phenomena are well known, but are not usually associated with the syndrome of mental automatism.

7. Passage of an invisible thought. The subject believes that a thought is imminent which he recognizes without being able to define and the idea recognized disappears without being defined. It is in some sort as if the patient had perceived the shadow of an object passing.

8. Echo of thought. Whenever the patient thinks, there is a running commentary as though someone in the neighborhood were reading aloud his thoughts. This phenomenon is a common and early symptom.

9. Enunciation of acts. The patient thinks he hears someone announce aloud every act he performs. "They repeat everything I do." "They say, 'Well, she is making her bed.' 'She is taking off her chemise.'"

10. Anticipation of thought. "They find before me the names of things." "They know before I do what I am going to say."

11. Flight of thought (Pierracini). The patients complain that their thoughts escape them before they have time to formulate them. "I am not master of my own tongue." "I have no more secrets." "My own ideas escape me."

The negative phenomena are no less interesting and have a great theoretical importance as will be explained. They consist of arrest of thought, seizure of thought, absence of thought, disappearance of thought, sudden forgetting, etc. The patients express these processes in various ways. "My thought disappears suddenly." "They cause me to forget." "They stop my thinking." "I wait for ideas which do not come." "They steal my thoughts."

To these various phenomena Heuyer and Lamache have added another which consists in this—that the patient believes he can read the thoughts of others (devination de la pensée).

All of these various phenomena may exist, or any combination of them, but the more abstract ones included under the name of psychic automatism appear first when the onset of the psychosis is insidious, to be followed by the more elementary sensory and motor automatisms (noises, play of colors, syllabic hash, nonsensical expressions) and finally by complete verbal hallucinations, internal conversations, etc.

De Clérambault sometimes isolates the more elementary and non-ideational processes (echoes, nonsenses, paresthesias, psychomotor phenomena and inhibitions of all sorts) under the name of *minor automatism* (petit automatisme) for reasons which will appear later.

Etiology of the Syndrome

Taking as a point of departure the ability of intoxications and infections to provoke hallucinations and illusions of all kinds and after an elaborate and exceedingly minute investigation of the manner in which they install themselves in the mentality of the patient de Clérambault postulates that all of the phenomena described above under the title of mental automatism have a mechanical origin in a physico-chemical alteration of the cells of the central nervous system, more particularly of the cerebral cortex.

The rôle which infections and intoxications play in the production of sensory and motor automatism is well known. Even such a gross lesion of the brain as a tumor may provoke visual, gustatory or olfactory hallucinations (Jackson, Horrax, etc.), and a localized syphilitic lesion motor hallucinations (Sérieux). But that the more abstract phenomena of the minor or ideoverbal automatisms are produced in the same way is not so readily admitted, and yet cases have been reported in which they were clearly caused by syphilis (Heuyer), mania (Logre), hypertension of the cerebrospinal fluid (Claude and Lamache), chronic alcoholism (de Clérambault), artificial menopauses (de Clérambault), epidemic encephalitis (Scharfetter), etc. In most cases, however, the cause is not evident and this is due to the fact that these phenomena are a late sequel, the result of insidious and systematic electivity. The cells are subject to a subtle but persistent attack at an age when their resistance is greatest.

The effects of intoxications and infections upon the central nervous system follow several laws.

1. The effects of each toxin is different. The electivity of response of the nervous system to various toxins is too well known to demand discussion. Even in the case of cocaine and chloral which both produce simultaneously tactile and visual hallucinations or illusions, there are differences in the effects of each toxin.

2. In general the cells are more susceptible the higher their position in the hierarchy of function. A good example is seen in the different stages of ether narcosis. Even among centers of the same level there are differences of susceptibility, if one is to judge from the hallucinatory psychoses. The cortical regions which give rise

to sensory, motor and psychic automatism are usually affected together, as for example in subacute alcoholism, but it is not always so, the motor zone being incomparably more resistant than the other two except in its verbo-motor portion. There seems also to be a sexual variation, the sensory zone being much more vulnerable in the female, especially the genital zone which is almost invariably attacked in the female and rarely in the male.

3. The cells defend themselves more easily the slower the attack. The effects of brutality of attack are well shown by alcohol. In acute episodes of chronic alcoholism visual hallucinations break out suddenly and are accompanied by even more gross evidence of derangement of the nervous system (tremor, perspiration, etc.), while in the more chronic manifestations auditory hallucinations are the rule and visual hallucinations are rarer. Moreover in the more insidious cases a stage preceding the complete auditory hallucinations may be observed including all the phenomena of the minor automatism (echo of thought, anticipation of thought, systematic contradiction, syllabic hash, etc.).

4. The period of latence between an infection, for example puerperal fever, and the onset of a psychosis is also an important factor. If the mentality is immediately affected, the subject in case of chronicity will have more massive troubles—confusion, affective dementia, and gross hallucinations; if the onset is retarded, the dementia will be less profound and the sensory phenomena more discrete.

5. The nervous cells defend themselves better as the patient gets older, at least until the onset of senility. There are numerous examples of this law, which is of great theoretical importance. The scale of ages shows us different effects of nervous lesion for each period of existence. In the fetal period gross medullary and cerebral defects result in paralysis and idiocy. In infancy the same insult results in more circumscribed motor defect and less pronounced psychic defects (imbecility, mental retardation). Later on perversions and disturbances of character are the principal effects; at puberty chronic confusion and dementia precox with dementia predominating; from twenty to thirty years, paranoid precox; from forty years onward, hallucinatory psychoses with total or subtotal conservation of intellect and affection.

Epidemic encephalitis has recently furnished a striking example of this rule. This extraordinary malady in early infancy produces defect of intellect (imbecility or even idiocy); in later infancy disturbance of sleep and hyperactivity without actual mental defect; at

the approach of adolescence perversions of character; around twenty years of age syndromes resembling paranoid dementia precox, and at more advanced ages only asthenia.

We might expect therefore that at an advanced age a subtle and long continued intoxication would attain only the highest neurones; that not all of these would be affected but only a variable number, depending on the subject and the toxin, and finally that they would not be destroyed but their function perverted.

Other arguments for a mechanical origin derived from the mode of onset of the hallucinatory phenomena will be outlined in the last section of this article on the rôle which mental automatism plays in the origin and development of the chronic systematized psychoses. But first it is necessary to present a brief outline of these psychoses as they are conceived by de Clérambault.

The Chronic Systematized Psychoses (Paranoia, Paraphrenia, Hallucinosis)

A good description of these psychoses is given by Sérieux and Capgras. For de Clérambault the most of the chronic systematized psychoses are mixed affections of divers origins. The pure psychoses he would limit somewhat as follows:

A. Constitutional psychoses.
   a. Passional psychoses (délires passionels de Clérambault).
      1. Erotomania.
      2. Querulousness (délire de quérulance).
      3. Jealousy (délire de jalousie).
      4. Fanatic idealism (idéalisme passioné de Dide).
   b. Interpretative psychoses (délire d'interprétation de Sérieux et Capgras).
   c. Imaginative psychoses (mythomanie de Dupré).

B. Degenerative psychoses.
   Chronic hallucinosis without delirium.

In class A hallucinations are absent, and in class B systematized delirium is absent. Such pure psychoses are rare. The vast majority of chronic psychoses are made up of varying combinations of these primary elements forming a third class (C), the chronic hallucinatory psychoses, which are therefore a sort of symbiosis.

A. *Constitutional psychoses.*—They are, one might say, a sort of hypertrophy of some constitutional trait, either passionate, interpretative, or imaginative. They evolve without any terminal defect of

intelligence. Three main types are recognized by Sérieux and Capgras.

a. *Passional psychoses.*—In a series of keen psychological analyses de Clérambault has shown that at the basis of this group lies a prolonged emotion in the form of desire or rage. Every conviction, he says, to which an emotion is attached, may serve as the nucleus of a passional delirium; sense of proprietorship, theoretical sense of justice, maternal love, religiosity in all its forms, etc. The emotion which is prolonged was in the beginning associated with a definite idea and this ideo-affective association remains an indissoluble unit, predominantly affective, which is impervious to the general ideation. The two essential signs are therefore (1) the obsession and (2) the morbid passionate exaltation. Their delirium evolves on a hypersthenic constitution. "Their thoughts and their sentiments are pushed by a maniacal force" (Schüle). The delirium starts explosively and spreads like a fan, the subject's passion inducing errors of judgment only in the realm of his obsession and its implications. The affective state may die out in the long run but the course of the malady is never terminated by a dementia.

1. *Querulousness.*—The querulant starts with the idea of an injustice suffered. The passional reaction is abnormal in intensity, in tenacity, in the reactions which it provokes, and disproportionate to the cause. If his injustice is legal he may start an endless series of processes against the judges and lawyers, who have decided against him. If he is a hypochondriac he may go so far as to kill the physician whom he accuses of aggravating his malady.

2. *Erotomania.*—The erotomaniac is characterized essentially by a passional obsessive state which pushes him to seek tirelessly the object loved. De Clérambault has shown that the erotomaniac is in no way a platonic lover and not at all averse to sexual voluptuousness. The patient starts from the conviction that he is loved and exclusively loved by a person of higher social rank who has first made advances. He only reacts to these advances. This conviction is maintained by the affective state in spite of every appearance to the contrary. The delirium tends to develop in three stages: stage of hope, stage of disdain, stage of rancor, but does not always reach the final stage, and especially hope is never entirely absent.

3. *Jealousy.*—The jealous delirium starts from a conviction of conjugal infidelity. It is distinguished from the simple emotion by the obsession, the morbid excitation, and the gross errors of judgment.

4. *Passionate idealism.*—Under this term Dide has described certain reformers, mystics, and inventors who, starting from a sudden

conviction concerning science, politics, religion, etc., hold passionately to their conviction, defending it with the most incredible errors of judgment, utterly impervious to reason, and ready to lay down their own lives or those of others in its propagation.

b. *Interpretative psychosis.*—This psychosis has been described in masterly fashion by Sérieux and Capgras. Its distinguishing features are (1) multiplicity of false interpretations serving to elaborate systematized deliria of various kinds; (2) absence of hallucinations; (3) conservation of psychic lucidity and activity; and (4) chronicity of the delirium with absence of terminal dementia. The subject of this psychosis rarely alters reality but explains it in his own way, adapting it to his own hopes and fears; in other words, giving it always a personal significance. The nature of the system of delirium which he builds upon these egocentric interpretations depends upon his circumstances, education, etc. One can distinguish many types—the persecuted, the megalomaniac, the jealous, the amorous, the mystic, the hypochondriac, etc.—and various combinations of them.

This psychosis is distinguished from the passional psychoses largely on the lesser intensity of the emotional state and the tendency of the delirious interpretations to spread instead of remaining fixed to one obsession. The patients are also largely hyposthenic and timid in contrast to the hypersthenic and aggressive individual who is the subject of a passional psychosis.

c. *Imaginative psychosis.*—Described by Dupré and Logre, this rare psychosis is distinguished by pure fabulation, gratuitous affirmations of fictional circumstances, recital of romanesque adventures, etc., instead of errors of deduction from real facts as occurs in the interpretative psychosis. All the other features of the two psychoses are identical. The false idea is given out without hesitation and is from that time on maintained as the absolute truth without variation. The delirium develops by progressive extension and is only feebly systematized because of its imaginative character.

B. *Chronic hallucinosis.*—This term includes all the phenomena described above under the name of mental automatism, more particularly of "petit automatisme mental" when they are not accompanied by a delirious interpretation on the part of the subject. It invariably leads to dementia of greater or less degree. Pure cases are rare. Usually the patient uses his mental automatism as a basis on which to build a chronic systematized delirium so that a chronic hallucinatory psychosis results.

Rôle of the Syndrome of Mental Automatism in the Formation of the Chronic Hallucinatory Psychoses

For M. de Clérambault the syndrome of mental automatism and more particularly the psychic or ideomotor automatism (petit automatisme mental) is the basal factor on which a hallucinatory psychosis is built. The systematized delirium is the reaction of the subject's personality to the phenomena which take place within him and which he feels are independent of and often contradictory to his habitual course of thought. The idea of persecution, the idea of jealousy, or any other idea is incapable of giving rise to any hallucinatory process.

De Clérambault insists that the initial phenomena which assail the patient are of neutral affective tone and nonideational (anidéic). They consist of echo of thought, enunciation of acts, paresthesias, noises, play of syllables, salad of words, arrest of thought, etc. The patients must be observed at the onset of their troubles, and for this purpose de Clérambault is ideally situated at the *Infirmerie Spéciale*. Later on the patients have either forgotten the initial phenomena, retrospectively misinterpret them, or become reticent and will not speak of them, being either defiant or entirely absorbed by their delirious ideas. Especially is it impossible later to determine the initial affective tone of the patient. The automatisme, surprising the patient in a neutral affective state, may never modify his character nor cause the construction of a delirium. In this case a chronic hallucinosis results. The subject, usually slightly euphoric, tolerates the phenomena without searching an explanation. He is somewhat astonished by them; doubts of their reality do not trouble him; sometimes he believes it an innocent practical joke. Usually, however, the patient reacts by the formation of a systematized delirium, the nature of which depends upon many factors: (1) the strangeness of the phenomena; (2) the intellectual make-up of the patient (culture, imaginative tendency, etc.); (3) the nature of the hallucinatory process and its concordance with the character of the patient; (4) his affective tone (pessimism, optimism, hostility, etc.). The delirious idea is the reaction of an intellect and affectivity which remain relatively intact to the automatic troubles which appear spontaneously and surprise the patient in a period of neutral affectivity and intellectual quietude.

1. *Strangeness of the phenomena.*—The strangeness, as well as the intensity, unexpectedness, and persistence of the impressions which assail the patient, who feels that they are alien to his habitual course of thought, and the habit which they have of breaking into the

middle of a train of thought or speech without having any connection with it, naturally lead the patient to the conviction that they are imposed upon him by some outside influence.

The phenomena are not always objectivated, even the purely sensory ones, and this again is due to their strangeness. One can no longer admit the total identity of the hallucination with a real perception. Hallucinatory sensations are less acute, less precise, less painful. The hypochondriac with coenesthetic hallucinations complains bitterly of tortures he endures but he does not have the motor contortions which accompany a person actually tortured in the way he claims. The auditory hallucinations seem to come nearest to reproducing an actual perception, but all the hallucinatory sensations of these patients have this incomplete character.

2. *Intellectual tendency and level.*—The imaginative capacity of the patient and his cultural level evidently play a rôle in the extent and elaboration of his delirious romance. An imbecile or senile person will offer but a paltry explanation for his many woes, while an intelligent person versed in the sciences or even in the so-called occult sciences (magic) will offer the most ingenious explanations of the means by which he is made to suffer.

The rational explanation that the phenomena may have been due to toxic localized stimulation of some of the higher neural connections in the cerebral cortex, however, is entirely beyond the capacity of even an intellectual patient. He usually seizes upon a witch, a demon, mental telepathy, or wireless telegraphy as the source of his troubles. It should not cause surprise to find even the most cultured patient allege the most incredible and childish origin. Recent work has shown how easily we all fall back into prelogical, perhaps prehistorical methods of thought. It takes but little to overturn the most healthy scepticism.

3. *Nature of hallucinatory phenomena.*—The nature of the hallucinatory phenomena have a great influence in fashioning the delirious superstructure, especially if they are of a kind to reinforce the preëxisting personality. For example, an individual already hypochondriac and excessively preoccupied with the state of his internal organs is assailed by painful coenesthetic hallucinations. His delirium is preëstablished. He may conclude simply that he has an incredible and inexistent malady or that his inner organs are inhabited by various animals. If he is a little less fearful and more imaginative he may believe his is possessed by a devil. If the hallucinatory sensations are agreeable the patient may give to them a mystic significance. Kinesthetic hallucinations also give rise to ideas of possession, usually

of external possession, the so-called delirium of influence (délire d'influence).

Visual hallucinations are rare and still more rarely exist alone. They are usually definitely perceived as irreal. They are essentially neutral; anxiety dissipates them; euphoria favors them and so they prosper usually in mystic deliriums. Olfactory hallucinations seem always to give rise not only to an exogenous explanation but also to ideas of persecution.

4. *Affective tone.*—Although it is certain that the phenomena of mental automatism often tend by their very character to give rise to ideas of persecution, they often do not do so even where an exogenous explanation is given. The worms or serpents may have been swallowed by accident; the patient believes himself poisoned, but by accident; he gets short-circuited in a wireless conversation; it is annoying, but accidental, etc. A patient hears a cry of "Stop thief." He looks around to see to whom such a cry may be addressed. He may hear such remarks for some time before it occurs to him that they really are addressed to him personally.

Other patients are only falsely called persecuted. They allege that the phenomena of which they are the subject are due to the malevolence of persons in their environment and may even name them. But their convictions are not very firmly established. They use such expressions as "One must believe it," "One is obliged to think so," "It is difficult to escape the conclusion that," etc. They are expansive and confident before the physician.

In order for a complete persecutory psychosis to develop upon a basis of mental automatism, it is necessary for the patient to have a paranoid personality of long date. The mental automatism is then ideally adapted to add fuel to the flames of his vindictive character.

The influence of preëxisting character may also be seen in the frequence with which old maids, timid, retiring, and usually altruistic, develop an automatism consisting essentially of friendly voices, and flattering themes without a systematized delirium.

A mythomaniac, perverse, jealous, erotic, or imaginative character will influence the nature of the delirious ideas in a similar way. The idea of persecution results from an attempt at explanation by a hostile personality. The same attempt at explanation by an imaginative and optimistic personality might give rise to a megalomaniac or mystic delirium.

Conclusion

The syndrome of mental automatism—sensory, motor, and ideo-verbal—is due to physico-chemical alteration of cortical neurones, or their connections, by a subtle and systematic insult at an age when their resistance is greatest. This alteration may be due to infection, intoxication, degeneration, traumatism, etc. The syndrome usually begins with nonideational (anidéic) phenomena—echo of thought, paresthesias, salad of words, etc. The subject, who is surprised by these phenomena in a neutral affective state, usually gives to them an exogenous explanation because of their strangeness and their lack of connection with his habitual psychism, and may react to them by erecting a system of delirious ideas determined largely by his previous personality, the result being a chronic hallucinatory psychosis.

BIBLIOGRAPHY

1. de Clérambault. Automatisme mental. Bull. de la Soc. clinique de méd. mentale, April, 1920, Dec., 1923, and Jan., 1924; Annales médico-psychologiques, Nov., 1923, Jan., 1924, and Feb., 1924; La Pratique médicale française, May, 1925, and June, 1926.
2. de Clérambault. Erotomanie. Bull. de la Soc. clinique de méd. mentale, Dec., 1920, Feb., 1921, June, 1921, July, 1921, June, 1923.
3. Sérieux and Capgras. Délires systematisés chroniques. Chapter X of Vol. I on psychiatry, 2nd Edition. Traité de Path. méd. et de Thérap. appliquée. (Sergent, Ribadeau-Dumas et Babonneix). Maloine, Ed., Paris, 1925. [Summarized by White. Outlines of Psychiatry. Ed.]
4. Heuyer and Lamache. Le symptôme de "devination de la pensée." Congres des médecins aliénistes et neurologistes. Paris, May 28–June 1, 1925.

INTRAVENTRICULAR HEMORRHAGE *

A CLINICAL AND PATHOLOGICAL STUDY OF THREE CASES

By Irving J. Sands, M.D.

ASSOCIATE IN NEUROLOGY, COLUMBIA UNIVERSITY; ATTENDING NEUROLOGIST, BROOKLYN JEWISH, AND BROWNVILLE HOSPITALS; ASSOCIATE NEUROLOGIST, MENTEFIORE HOSPITAL

AND

Max Lederer, M.D.

PATHOLOGIST TO THE BROOKLYN JEWISH HOSPITAL

From time immemorial, hemorrhage into the ventricles has attracted the attention of physicians. Because of etiological considerations the clinical course and anatomical picture, the internist, the neurologist, and the pathologist have found much of interest in this morbid condition.

Sanders in 1881,(1) studied 94 cases from the literature, and made some valuable deductions. He stated that the most common and direct cause of primary intraventricular hemorrhage was rupture of some vessel on or near the ventricular walls. He mentioned seven sources from which the blood might come, *i.e.*: (1) the vessels of the choroid plexus; (2) vessels of the tela choroidea; (3) arteries ramifying on the ventricular walls, viz., the choroids, branches of the arteries of the corpus callosum, etc.; (4) veins, *i.e.*, vena corpora striata, those of the thalamus the vene galeni, etc.; (5) large aneurisms encroaching upon or existing within the ventricles; (6) tumors involving neighboring parts and pressing into the ventricles, or those actually found within these cavities themselves; (7) inflammatory conditions or ulcerations of the ventricular walls.

According to Gowers (2) "the blood usually comes from the vessels of the choroid plexus, as of the velum interpositum, rarely from a vein in the wall of the ventricle. Probably the hemorrhage is due in most cases to the rupture of miliary aneurisms, which have been found in the choroid plexus. But it occasionally results from severe mechanical congestion, as in attempted hanging, from convulsions, or after a severe concussion, sometimes at an interval of a few days or one or two weeks. In rare cases it proceeds from a large aneurism that has perforated the ventricle, or from a vascular

* From the Pathological Department of the Brooklyn Jewish Hospital.

growth, or occurs in hemorrhagic diathesis, as purpura or leucocythaemia."

Gordon (3) reports 12 cases of extra- and intraventricular hemorrhage, 5 being primary ventricular hemorrhage and 7 being secondary effusions into the ventricles from an original extraventricular area situated close in the vicinity of the cavity. In two of his cases the sources of bleeding could be distinctly seen in the choroid plexus. He added that "the most interesting manifestation in primary ventricular hemorrhage of my 5 cases were: sudden onset; the most profound coma from the very beginning; convulsions more marked on the side opposite to the lesion than on the same side in the unilateral cases, and on the side opposite to the seat of the largest hemorrhage of the bilateral cases; finally the absence of marked paralysis. In the cases of primary variety, life persisted in from 6 to 24 days."

According to Oppenheim,(4) primary ventricular hemorrhage occurs only rarely. Usually there is a neighboring hemorrhage which has broken through the ventricular wall and has filled all the cavities. When that occurs, the result is increased disturbance of consciousness, increased paralysis of all extremities, convulsions, and rigidity. Usually there is slowing of the pulse, increased respiration, and bloody spinal fluid. According to this authority death is inevitable, and usually follows within 24 hours after the original onset.

That a small number of cases of intraventricular hemorrhage recover, is acknowledged by most authorities. Lannin (5) reported a case of intraventricular hemorrhage in a child of ten years who had collided with a playmate, both children's heads striking and both falling to the ground. Two hours later, unconsciousness, tonic and clonic convulsions of both arms and legs, more on the left side, ensued. The pupils were widely dilated, eyeballs were turned to the right, and there was a right facial paralysis. A right decompression was done and there was no blood in the subarachnoid space, but there was blood in the right lateral ventricle. Recovery followed in this case.

That the diagnosis of ventricular hemorrhage is often very difficult, even by an expert under the most ideal conditions, is illustrated by Elsberg's (6) report of a case of a ruptured aneurism of the right middle cerebral artery into the ventricles. The patient, a man of twenty-one years of age, of negative family history and a good personal history, fell and struck his head. Twelve days later he stooped to open the furnace door and he experienced sharp pain in his head, felt dizzy and faint, and became unconscious. Stupor persisted for 24 hours. He then complained of headache and of

diplopia. Bloody spinal fluid was obtained. The Wassermann reaction on this fluid was negative. Thirteen days after the beginning of his illness he had a generalized convulsion, and was unconscious for an hour. A second spinal fluid was again bloody. Three days later he was admitted to the Neurological Institute where he complained of headache, faintness, dizziness, and general prostration. At that time he showed beginning bilateral papilledema, sluggish knee jerks, loss of ankle jerks, rigidity of neck and bloody spinal fluid. Three weeks after the beginning of symptoms, he began to complain of blurred vision in the right eye. The temperature rose to 101°. The right pupil became larger than the left and did not respond to light, and there was papilledema of two diopters of the right eye. The left knee jerk was livelier than the right. There was diminution of the right abdominal reflexes. He then had a convulsion involving the left arm and left leg and both sides of the face, and he became stuporous. The diagnosis lay between a tumor near the lateral ventricle on the right side with hemorrhage, and a ruptured aneurism in the anterior or middle cranial fossa on the right side. Bilateral decompression was done, but the patient did not improve, and died about 8 hours after operation. Post-mortem examination revealed a small aneurism connected with the right middle cerebral artery near its origin, which had ruptured into the frontal lobe. The mass of blood then ruptured into the ventricles.

Tilney and Casamajor (7) had a patient under close and continuous observation from one hour after the onset of the illness until death which ensued 12 hours later. They correlated the clinical and the pathological data. They divided the symptoms into two groups, those resulting from hemorrhage into the cisterns, and, secondly, those resulting from extent of the hemorrhage into the ventricles. According to these observers, the symptoms of hemorrhage into cisterns are:

1. Sudden, intense pain in the head, having a wave-like character rapidly increasing in severity and accompanied by severe pain extending from the neck to the shoulders, hips and rectum. This pain lasts for several moments when the patient suddenly becomes comatose.

2. Propulsive vomiting followed by forceful, spasmodic defecation and urination. This occurs shortly after the establishment of coma and may recur at intervals for several hours.

3. Tonic, sustained cephalogyric and oculogyric spasms.

4. Tonic contraction in the arms and legs accompanied by muscular spasms producing rhythmical abduction and adduction of the

upper and lower extremities. These convulsive movements are synchronous with repiration and persist for several hours.

5. Rapid, irregular cardiac activity with high, fluctuating blood pressure. Cheyne-Stokes respiration. In the course of several hours these cardiac and repiratory symptoms cease.

6. No initial change in the reflexes but later a loss of the superficial reflexes, an increase of the deep reflexes and the appearance of a bilateral Babinski.

7. Moderate degree of bilateral choked disc, *i.e.,* one to two diopters.

8. Slight rise of temperature, *i.e.,* 100°–101°.

The symptoms indicating extension of the hemorrhage to the ventricles are:

1. Repeated tonic spasm of the entire somatic musculature, holding the trunk and neck in orthotonos, the extremities extended with exception of the fingers, which are flexed.

2. These spasms last for one to two minutes and are followed by an interval of complete relaxation.

3. Marked elevation of the blood pressure followed by a rapid decline.

4. Irregularity of cardiac and respiratory action.

Their report was so thorough and so instructive, that it enabled us to correctly diagnose our cases.

With the above data in mind we wish to report the following three cases that have recently come to our observation:

Case I. T. W. W., male, fifty-seven, white, married, U. S., admitted November 25, 1925, at 4:40 P.M. and died November 26, 1925, at 4:15 A.M.

The man was native born, with negative family history. He was married for thirty-five years. His wife had given birth to two children who died immediately after birth. She had never miscarried. According to the information given by the patient's wife, he was being treated for high blood pressure for the past six months, the highest being 185 systolic. He never had any paralytic strokes. In the morning of November 25th he complained of headache. He left his home, however, for his work as a janitor in a high school. At 11:30 A.M. while at work, he suddenly cried out with pain, screaming that his head hurt. He gripped the wall to protect himself from falling. He was carried into the school office, his right leg being paralyzed. He was then taken home in a taxi. On arriving home he muttered a few syllables, vomited and became unconscious. An ambulance was called and he was admitted to the hospital at 4:40 P.M.

An examination at that time revealed the patient to be comatose, the respiration was Cheyne-Stokes in character, and later changed to noisy irregular breathing, with periods of apnea. Pulse was 100, small, thready, and of poor quality. There was no evidence of external injury to head or to body. Pupils were contracted and did not react to light or to accommodation. The eyes were turned to the right; right corneals were absent. There was flaccid paralysis of the left-upper extremity, and spastic paralysis of both lower extremities. There was no rigidity of the neck, no Brudjinski, no Kernig. The left knee jerk was somewhat increased; the right knee jerk was sluggish. Left biceps was

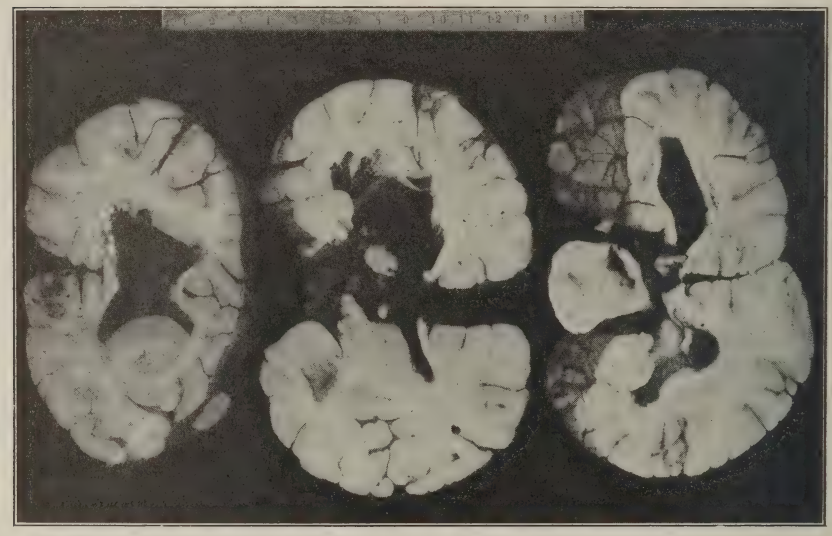


Fig. 1. Case I. Note all ventricles filled with blood.

greater than the right. There was an indefinite Babinski on the left side. There was no bleeding from the ears, nose or mouth. The heart was moderately enlarged to the left; the left border reached almost to the anterior axillary line. The sounds were of poor quality and barely audible. Lungs were negative.

A catheterized specimen of urine showed a trace of albumin and hyaline and granular casts. Blood pressure was 110–90, pulse 101. At 5:45 pulse was 60, blood pressure 120–86. At 6:30 P.M. the pupils did not react to light and the corneals were absent. Both upper extremities were flaccid with diminution in deep reflex response on the right side; both lower extremities were hypertonic and there were bilateral increased knee jerks, but no ankle clonus. There was a suggestive Babinski on the right side. The respirations were irregular in rate and rhythm and they were 30 per minute—pulse was 79—temperature 100.6. Spinal fluid was bloody, under increased pressure, and was reported negative

for Wassermann reaction. Blood was also negative for Wassermann reaction.

At 9:45 P.M. patient was still comatose, face was flushed, Cheyne Stokes breathing, and pupils were irregular. Abdominals, knee jerks, ankle jerks, and cremasterics were absent. There was no Babinski. Bilateral Kernig was marked—no cervical rigidity—spasticity in lower extremities was present. Discs showed slight definite papilledema. Blood pressure at this time was 230–110.

From the very beginning when the patient was observed in the hospital, there were peculiar adduction and abduction of the upper extremities and to a lesser degree of the lower extremities, which lasted six hours and which were of the type described by Tilney and Casamajor in their case. This was a very striking symptom, which aided in establishing the correct diagnosis of intraventricular hemorrhage. Patient died 4:15 A.M. November 26, 1925.

Post-mortem.—Calvarium removed with ease. Dura was somewhat congested. On incision of the dura there escaped blood tinged spinal fluid. On removal of the brain there was a small blood clot in the intrapeduncular space more on the left side. The basilar artery showed numerous atheromatous areas as did both middle cerebral vessels.

On section of the brain there was a hemorrhage which filled the entire ventricular system. Efforts to find the bleeding vessel proved unsuccessful, as the brain had been hardened in situ. Microscopic examination showed moderate arteriosclerosis of all the large and small vessels and general edema. No evidence of any inflammatory reaction was found. The other findings are epitomized as follows:

Both lungs show evidence of old healed tuberculosis, emphysema, bronchitis and pulmonary edema. The heart is the seat of a general enlargement which is mostly right sided. The coronary vessels are normal. The aorta contains a few atheromatous plaques. The kidney showed slight changes incidental to a mild arteriosclerosis. About the gall bladder region there were numerous adhesions. The liver edge was scarred and gall bladder wall thickened.

Case II. J. R., aged sixty, was admitted to the hospital on February 2, 1925, at 7:15 P.M. and died at 8:15 P.M. of the same day. He was an Italian, baker by occupation, married and had four children. He was a hard worker all his life, drank moderately, and there was no history of any previous serious illness.

For six months previous to his illness, the patient had been complaining of headache, especially on arising, of dizzy spells, and of spots before his eyes. Two months before his illness, he discontinued his work because of these symptoms. At 6 P.M. while at dinner with his family, he suddenly collapsed, fell to the floor, foamed at the mouth, vomited, and immediately became unconscious. The ambulance was called

and he was admitted to the hospital 7:15 P.M. He was comatose, cyanotic, had definite Cheyne-Stokes respiration, and foaming at the mouth. There were audible pulmonary rales. The pulse was 184, regular. Heart sounds

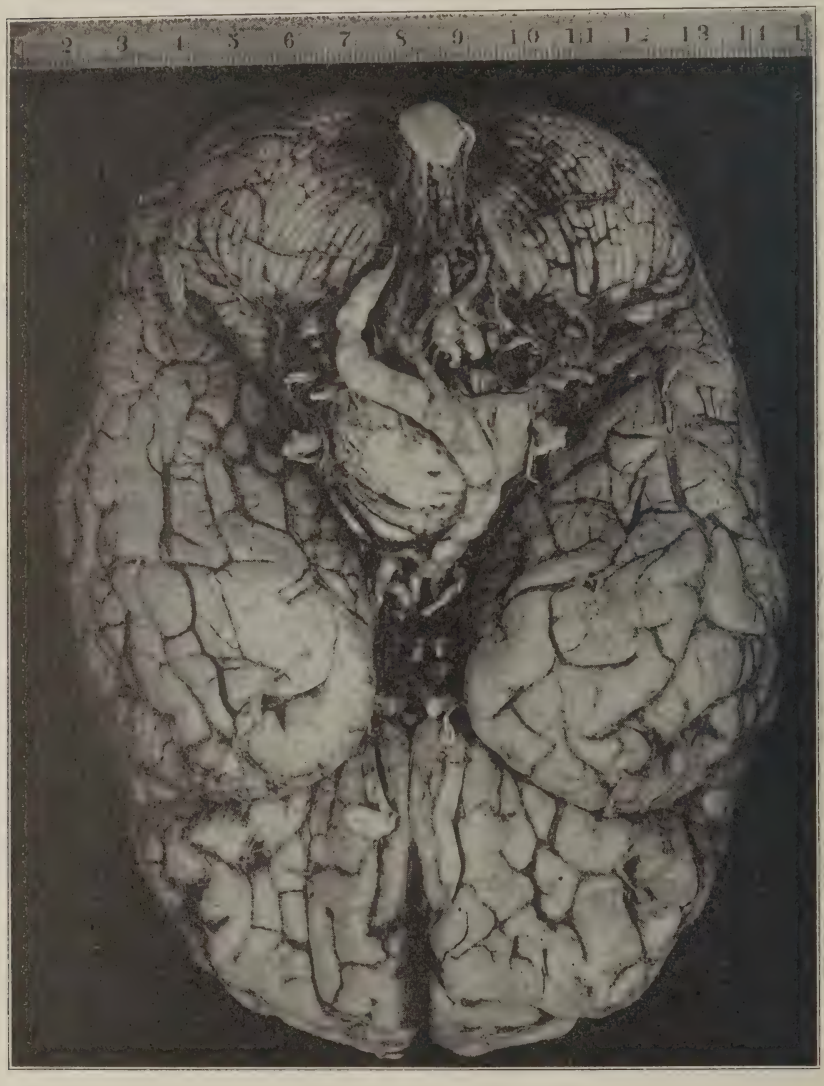


FIG. 2. Case II. Note marked arteriosclerosis of all vessels, and hemorrhage in the cerebello-medullary cistern.

were feeble and distinct—there were no murmurs audible. Abdomen was distended. Blood pressure was 236–140. The pupils were dilated and fixed. There was right facial weakness. Right biceps and triceps

were 4 plus, while those on the left were 2 plus. Left knee jerk was 2 plus. Abdominals were absent. The lower extremities were flaccid, and the upper extremities showed some hypertonicity. There was no Kernig, and no pathological reflexes were elicited. Ten cubic centimeters of bloody spinal fluid was removed under increased pressure.

Second blood pressure reading was 204–100. Patient died at 8:15 P.M.

Post-mortem.—Skull was very thick. Dura was clear and glistening. No subdural hemorrhage was seen anywhere. The brain showed marked arteriosclerotic changes. The left vertebral, the basilar arteries, and the three cerebral vessels were markedly sclerosed. There was a subarachnoid hemorrhage filling the cerebello-medullary cistern. The sagittal section revealed hemorrhage which filled the entire fourth ventricle which apparently came from a large pontine hemorrhage. The other ventricles were free from fluid.

Microscopically, there was considerable fibroplastic thickening of the pia with thickening of the vessel wall. There was moderate satellitosis. There was no evidence of any inflammatory reaction.

Findings of the other organs are as follows: Lungs—pulmonary artery is the seat of a marked atheromatosis. The bronchi are congested and there is pulmonary edema. The heart is greatly enlarged due to an extreme hypertrophy of the left ventricular wall. There were a number of areas of fibrosis. The musculature showed some tigering. The aortic cusps were somewhat sclerotic. Right heart was dilated and slightly hypertrophied. Foramen ovale was patent. Aorta showed some atheromatosis which was specially marked in the descending portion. Coronary vessels were patent, but showed some sclerosis. The liver was markedly enlarged and fatty. Pancreas is atrophied. Kidney—right kidney weighed 320 gms. Capsule stripped with difficulty. Surface showed many depressed areas. On section, striations of cortex not clear. Vessels throughout were prominent, and showed lesions of arterio and arteriolar sclerosis. Left kidney weighed 720 gms. and was the seat of myriads of cysts varying in size and containing clear fluid. Islands of apparently normal renal tissue free from cysts were scattered throughout.

Case III. R. C., thirty-one, white, U. S., widower, admitted February 21, 1926, died March 21, 1926.

Family history was negative. Patient was an only child. He had a common school education. He worked as a clerk for a steamship company. He married in 1918 and has one child. His wife died from postpartum infection. The child is living and well. Patient led a moderate life, smoked and drank in moderation, and never had any serious illness.

On January 23, 1926, while at work patient fainted; he was not unconscious very long, and was able to go home. That night he vomited

five times. Since then apparently he had been quite drowsy after working hours, sitting down and resting most of the time. He had headaches which were not localized, but which were worse on the top of the head. On February 17th he suddenly became unconscious in his place of business. He was removed to the Kings County Hospital. There he was stuporous, drowsy and did not recognize anybody. Within 12

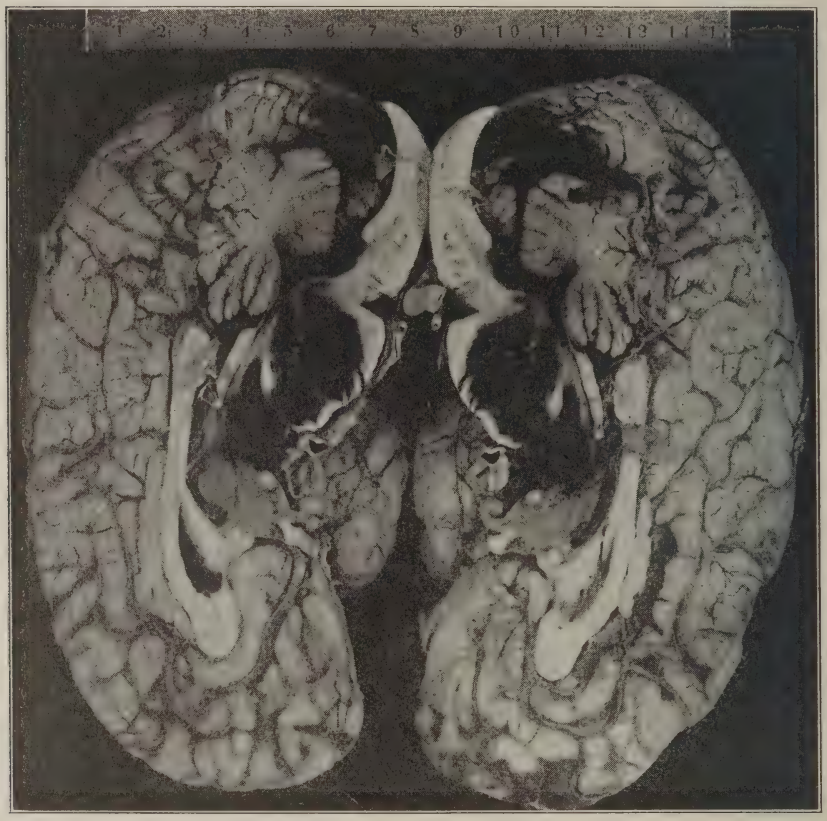


Fig. 3. Case II. Note hemorrhage into pons, fourth ventricle and cerebello-medullary cistern.

hours he regained consciousness. Four days later he was transferred to this hospital.

On admission, he showed marked cervical rigidity with marked Kernig. Pupils were equal, regular and reacted well. Eye grounds showed moderate blurring of discs. There were apparently no cranial nerve lesions. There was diminution in all deep reflexes. Abdominals were very sluggish. No Babinski or modifications. He complained of intense headache which seemed to come from the back of his head

and would shoot towards the top. Spinal fluid puncture revealed bloody fluid under moderately increased pressure. The blood count showed hemoglobin of 65 per cent, erythrocytes 4,000,000, leucocytes 24,000, polymorphonuclears 85 per cent, mononuclears 4 per cent, lymphocytes 11 per cent. The specific gravity of the urine was 1,029 and contained no albumin, no sugar or casts, but positive acetone reaction. X-ray of the skull was negative. The Wassermann reaction done on the blood and spinal fluid was negative. Spinal fluid gave a colloidal curve of 555543210, which was typical of a bloody fluid.

The patient's condition continued to improve while in the hospital, his chief complaint being persistent headaches. His temperature at first was 100 and later went up to 101 and finally came down to normal. His pulse varied from 100 to 90. Respiration varied from 25 to 20. A note made by one of us (I. J. S.) on February 27, 1926, stated that the patient at that time showed slight but definite cervical rigidity with diminished deep reflexes, no cranial nerve lesions, no cerebellar signs. Our impression was that we were "dealing with a subarachnoid hemorrhage, most likely from a leaking intracranial aneurism." A second spinal fluid showed the following: Fehling's solution was reduced, albumin 2 mm. ring, globulin positive one plus, the Wassermann reaction was negative. The second blood count showed leucocytes 14,000, polymorphonuclears 74 per cent, mononuclears 4 per cent and lymphocytes 22 per cent.

At 11 P.M. on February 28, 1926, the patient began to froth at the mouth, and there were twitchings of the left side of the face. There were clonic movements on the left upper extremity. He was comatose, respiration was irregular, slow; pulse was of good quality. The twitchings and convulsive seizure lasted about 10 minutes and then there was a free interval of five minutes, when the convulsions again returned. This occurred six times. Finally the patient ceased to breathe.

Post-mortem.—Skull was removed with ease. Dura appeared clear and glistening. On incision of dura no blood was seen. Brain weighed 1,450 gms. There was considerable congestion of the brain. A subpial hemorrhage was present over right precentral area. There was a subarachnoid hemorrhage in the interspace between two cerebellar hemispheres. In the region of the left anterior interpeduncular space there was a blood clot which was adherent to the left posterior communicating vessel of the circle of Willis. The brain was fixed in formalin and sectioned. The entire ventricular system was filled with blood clot. On study of the circle of Willis there were two aneurisms, each the size of a small pea which arose from the left posterior communicating artery near its origin from the left internal carotid artery. Both had ruptured, the upper one into the left inferior horn of the lateral ventricle and the lower one into the subarachnoid space. The inferior horn of the left lateral ventricle was three times the size of the corresponding horn on

the right side. Microscopic examination failed to reveal any evidence of inflammatory reaction. The pia was thin and glistening. The brain showed some edema and congestion.

The thoracic and abdominal organs showed no noteworthy changes.

Summary

It is quite evident that premonitary symptoms of intraventricular hemorrhage are absent. The headache, dizziness, fainting spells, etc., which are present in two of our cases pointed to the concomitant cerebral arteriosclerosis. The last case, in which the aneurisms were found, presented a chain of symptoms that are frequently seen in cases of ruptured intracranial aneurisms (8). The acute onset of cranial symptoms in a man of known cerebral arteriosclerosis, or suspected intracranial aneurism, with the early appearance of coma, the persistent bloody spinal fluid, the presence of repeated tonic spasms of the entire somatic musculature, with the absence of classical signs of paralysis, should lead to the diagnosis of intraventricular hemorrhage.

The presence of a multilocular unilateral cystic kidney in the second case, makes it of additional interest from a pathological viewpoint. The leukocytosis in the last case is illustrative of the general leucocytosis that occurs after extreme hemorrhages, and which has been ably discussed by Musser.(9) The sustained elevation of temperature is explained by the toxic effects of the liberated blood, and by pressure and irritation of the blood on the area of the tuber cinereum which is said to contain thermotactic centers (7). Of academic interest is the problem of which ruptured aneurism has killed the patient. The large size of the left inferior horn of the lateral ventricle would point to the probability of a long period of time during which the blood had collected and distended it. On the other hand, the earlier clinical course of the disease would lead to the conclusion that there was at first a rupture of the lower aneurism into the subarachnoid space, and from which apparently the patient was recovering. The appearance of the clots in the two aneurisms did not shed any light on the subject. The failure to find the bleeding points in the first two cases is attributed to the otherwise sound policy of immediate fixation of the brain in formalin.

BIBLIOGRAPHY

1. Sanders, Edward. A Study of Primary, Intermediate, or Direct Hemorrhage into the Ventricles of the Brain. Am. Jr. Med. Sc., 82:85, (July) 1881.

The Symptomatology of Primary, Intermediate, or Direct Hemmorhage into the Ventricles of the Brain. Idem, 82:337, (Oct.) 1881.
2 Gowers, W. R. A Manual of Diseases of the Nervous System. Vol. II, p. 391. P. Blakiston's Son & Co., Phil., 1903.
3. Gordon, Alfred. Ventricular Hemorrhage, A Symptom Group. Arch. Int. Med. 17:343, (March) 1916.
4. Oppenheim's Lehrbuch der Nervenkrankheiten. S. Karger, Berlin, 1923, Vol. II, p. 1231.
5. Lannin, G. E. J. Hemorrhage into the Lateral Ventricle, Recovery. Canad. J. M. & S., 38:119, (Oct.) 1915.
6. Elsberg, C. A. Ruptured Aneurism of the Right Middle Cerebral Artery. Neurological Bulletin, 1:210, (May) 1918.
7. Tilney, F., and Casamajor, L. Hemorrhage into the Basal Cisterns and Ventricles of the Brain. Neurological Bulletin, 1:161, (April) 1918.
8. Sands, I. J. Intracranial Aneurisms. Jour. Nerv. & Ment. Dis., 64:12, (July) 1926.
9. Musser, J. H., Jr. The Leucocytes After Hemorrhages. Am. Jr. Med. Sc., 162:40, (July) 1921.

INTRAVENOUS TREATMENT OF SOME EPILEPTICS WITH CALCIUM CHLORIDE AND GLUCO-CALCIUM *

By Elmer Klein, M.D.
ST. ELIZABETHS HOSPITAL, WASHINGTON, D. C.
AND
Eugene Forcione, M.D.
WASHINGTON, D. C.

This work was prompted by an article in the Revue Neurologique in which Petzetakis (1) reported some favorable results from the use of calcium chloride injected intravenously. He varied the dosage during the four months of the treatment from .5 gram every other day during the first month to .8 gram on alternate days the second month, then back to .5 gram the third month, and again .8 gram twice weekly during the fourth month. His series consisted of only two cases of essential epilepsy, and in both cases he reported the disappearance of the seizures and the clearing up of other associated symptoms. It is not stated just how long the cases were followed up. It is also interesting that an injection of calcium chloride was given during a seizure which curtailed it to one minute from the usual five-to-ten-minute period.

Disregarding the work of Rossello (2) and Lovero (3), this worker was the only one to have given calcium intravenously to patients suffering from epilepsy. The work of these other two cannot be used in any critical evaluation of the substance in this disorder, for, while their patients had epileptic manifestations, the calcium was administered primarily for the tuberculosis from which they were suffering.

The administration of calcium in the treatment of epilepsies is not new, albeit its use rests chiefly on empirical grounds, for the pharmacological action of the substance is complex and little known. Thus Cushny (4) says in summing up its actions: "Calcium appears to depress the neuromuscular connections in striated muscle like curare and later to weaken the muscle itself. The removal of lime is said to increase the irritability of the terminations of the autonomic nerve in mammals." On the other hand, its action on the vagus is

* Read before the Washington Society for Nervous and Mental Diseases, January 20, 1927.

just the opposite. Sabbatani (5) was probably the first one to undertake a critical examination of the action of calcium salts on the body both in normal and epileptic individuals. He showed that the distribution of calcium in the cells is in a state of equilibrium. When he experimentally reduced the calcium in animals there occurred excitation, convulsive seizures, and an increased local irritability of the cerebral cortex. On the other hand, an increase in the calcium content gave rise to depression. From these phenomena he concluded that epileptic seizures are induced by a reduction of calcium, and that by increasing the calcium content of the body the convulsive seizures would be reduced or stopped.

In a later and more accurate study Frisch and Weinberger (6) conclude that preparoxysmally and during the height of the seizure the chloride ion of the calcium chloride is retained in the tissues while the calcium ions are discharged into the blood, which determines an increased irritability of the central nervous system. After an attack there is restoration of the chemical equilibrium. These workers seem to regard the chemical interchange in the tissues as being causative rather than associative factors. On the basis of the assumption which underlies such work as quoted above by the last named three workers, namely, that it is calcium deficiency in the nervous tissue which determines the hyperirritability and seizures, many therapeutic attempts have been made in the handling of epilepsy. Audenino and Bonelli (7) treated ten cases with calcium salts and reported favorable results in all but one. To six of the patients the salts were administered per os, to four hypodermatically. Linguerri (8), repeating the experiments of Sabbatini, confirmed his results. Silvestri (9) had similar experiences with three patients to whom he gave one to three grams of calcium hypophosphate daily by mouth. Ciccarelli (10) reported improvement in all the twenty-nine cases to whom he orally administered calcium salts. Bryant (11) obtained beneficial results from the administration of calcium lactophosphate in patients with petit mal attacks. However, Donath (12), who had done much work with epileptics, obtained almost negative results with nine patients to whom he gave three to nine grams of calcium chloride by mouth. Lallement and Dupony (13) treated fourteen epileptics with calcium lactate with negative results. Indeed, they observed an increase in the number of attacks during the period of the treatment. An interesting undertaking was that of Obregia and Urechio, (14) who injected .1 to .2 grams of calcium chloride intraspinally. They treated eighty-six cases, and their work was carefully checked. Uniformly negative

results were obtained save in those cases in which, in addition to the calcium, bromides were also given.

In all the therapeutic attempts with calcium that have come to the writer's attention the drug was given by mouth. Exception to this are the intraspinal work just mentioned (Rossello (2) and Lovero (3) really gave it for tuberculosis), the work of Audenino and Bonelli (7), who treated some of their patients hypodermatically, and that of Petzetakis.(1) It was generally accepted that calcium was absorbed from the intestinal tract into the blood stream with difficulty, and it was in order to overcome this obstacle that these workers seemed to have resorted to the para-oral route. The assumption concerning the absorption of calcium from the alimentary tract was first shown to be incorrect by Hjort,(15) who, by allowing dogs to ingest various calcium salts and by determining the calcium concentration of the blood serum at hourly intervals, showed that calcium is rapidly absorbed and relatively rapidly eliminated. While our work was under progress, Roe and Kahn (16) published their findings of similar experiments in human subjects and showed that the curve of calcium absorption and elimination from the alimentary tract is roughly analogous to the sugar curve. They obtained an 81 per cent increase of calcium in the blood serum from the oral administration of large doses of calcium lactate. Had this fact been known earlier it would have made the undertaking of this work unnecessary. While the supposed difficulty of calcium absorption from the walls of the intestine made the intravenous route the one of choice in the present work, no defense is offered for the pharmacologic rationale for the use of calcium itself. Opinions of pharmacologists and therapeutists are too conflicting for that, and it was undertaken largely on empirical grounds. Drugs can and do alter the condition of the organism, make it vary in its susceptibility to stimuli, and modify its responses. The logic of empiricism would permit its usage whether one's conception of the convulsive disorders was one which rested on a basis of neuropathology or whether it rested on a broader basis in which convulsive seizures are looked upon as a mode of reaction of the total organism in response to effective stimuli, whether biologic, psychologic, or both. Thus it may well be that it is some chemical or biologic deficiency which conditions the convulsions in some cases, while in others the calcium deficiency may merely be a part of the total organismic change much in the manner of the changes which occur in the secretion of adrenalin in emotional alterations. In support of this view is the work of Glazer,(17) who was able to parallel

the curve of the calcium content of the blood serum with the curve of excitement and sedation which he verbally induced in patients.

Whether the convulsions are an expression of a general personality disorder or of a biologic defect, it was hoped in the light of the recent favorable empirical results cited that the intravenous calcium might exert some favorable influence in the course of the disease. Since the decrease or increase in the number of seizures was to be the criterion of improvement—though it is recognized that an improvement in the seizures may not *ipso facto* be an improvement in the disease—cases were selected with the highest number of monthly seizures. No discrimination was used as to the type of epilepsy, as it was felt that by taking a promiscuous group deductions from the results would be facilitated and indications for the drug, if any, more readily affirmed. It is entirely possible that the conflicting results obtained by different workers was largely due to the preponderance of one type of epileptics in some groups over others.

There were twenty-seven cases selected. Of this group one refused the treatment after six weeks, one after eight weeks, and two after three months; one eloped six weeks after his treatment was begun. Only twenty-four cases will, therefore, be considered, since those who received but brief treatment do not allow their being included in this study. Of these, fifteen were patients with essential epilepsy; in five trauma was given as the precipitating factor; in one arteriosclerosis, and three had seizures as a result of some infantile encephalopathy. One of the patients had a history of lues with a paretic serological curve, and another is probably a case of catatonic dementia precox with episodic seizures. Incidentally, this is the only case in which there was diminution of the attacks. In all the other cases there was a consistent increase from one a month to five times the original number of seizures. In one or two cases the initial increase of seizures was probably due to the withdrawal of the luminal which they had been taking until then. Again, in some of the cases the seizures were on the increase before the treatment was begun. The injections were started at the swell of the tide without mitigating its rise. The conclusion, however, is inescapable, that there was a general tendency towards an increase in the number of seizures in most of the cases treated. In no case was there diminution of the seizures at the beginning of the treatment, as is so often noted in epileptics with the initiation of almost any therapeutic measure.

The patients were divided into two groups without reference to their type or condition; 14 of these received calcium chloride and

13 received gluco-calcium. Calcium chloride was injected in a 5 per cent solution at the following rate and dosage:

.5 gram twice weekly during the first and second months
.75 gram twice weekly during the third month
1.0 gram twice weekly during the fourth month

Gluco-calcium is stated to be a degradation product of glucose and calcium and was designed for use in pulmonary tuberculosis, its supposed advantage being its low toxicity. The higher concentration of calcium in this compound (15 c.c. of the solution being equivalent to 1 gram calcium chloride) permitted the introduction into the blood stream of more than twice the amount of calcium than is present in the same quantity of 5 per cent calcium chloride solution. But the disagreeable burning sensation precluded its injection in much larger doses. It was injected for a period of five months as follows:

1 gram twice weekly during the first and second months
1.33 gram twice weekly during the third month
1.66 gram twice weekly during the fourth month
2.0 gram twice weekly during the fifth month

Before these injections were begun the calcium concentration in the blood serum of each patient was determined by three tests at 48-hour intervals. At the end of each month the calcium concentration of the blood serum was again determined, forty-eight hours subsequent to the last injection. Determinations were made on the whole blood according to the Kramer-Tisdall method, blood coagulation being prevented by the addition of sodium-citrate. As might be expected, in accordance with the findings of Roe and Kahn, the initial excess of calcium was eliminated so that at the end of forty-eight hours there was no conspicuous increase sustained. In all cases the increase was within the limits of physiological variation. Nor did the larger doses of gluco-calcium result in a higher blood calcium concentration. Both calcium chloride and gluco-calcium were injected during the course of some seizures without shortening the seizure or producing any perceptible change in their character. The serological and clinical results were equally negative.

Conclusion

1. There was no benefit derived from the use of calcium over four- and five-month periods in various types of epilepsy. Not only was there no diminution in the number of seizures but there was a tendency toward an increase.

2. No advantage was seen in the use of gluco-calcium over calcium chloride.

3. There was no sustained increase in the calcium concentration of the blood serum after the injection of one-half to two grams of calcium salts.

BIBLIOGRAPHY

1. Petzetakis, M. Arrêt d'une crise épileptique aprés injection intraveineuse de chlorure de calcium. Revue Neurologique, 32:174, 1925.
2. Rossello, H. J. Calcio en epilepsia. An. fac. de med., Montevideo, 5:487–505, 1920.
3. Lovero, N. Cloruro di calcio per via endovenosa nella cura dell' epilessia. Gazz. med. napolet., 6:387, 1923.
4. Cushny, A. R. A Textbook of Pharmacology and Therapeutics. Lea and Febiger, Philadelphia and New York, 1918.
5. Sabbatani, L. Calcio negli epileptici. Arch. di psychiat. (etc.), Torino, 23:66, 1902.
6. Frisch, F., and Weinberger, W. Untersuchungen bei period. Epilepsie. Zeitschr. f. d. ges. Neurol. u. Psych., 79:576, 1922.
7. Audenino, E., and Bonelli, A. Azione del calcio negli epilettici. Riforma med., Roma, 18:674–477, pt. 3, 1902.
8. Linguerri, D. Sali di calcio nell' epilessia. Bull. d. sc. med. di Boligna, 6:656–664, 1906.
9. Silvestri, T. Epilessia e sali di calcio. Gazz. d. osp., Milano, 28:22–24, 1907.
10. Ciccarelli, A. Policlinico Roma de Prat, 16:133–165, 1909.
11. Bryant, J. Use of calcium in treatment of epilepsy. Boston M. and S. J., 153:547, 1915.
12. Donath, J. Der Wert des Chlorcalciums in Behandling der Epilepsie. Epilepsia, Amst., 7:141–155, 1909.
13. Lallemant, E., and Dupony, R. Traitement des épileptiques par le lactate de calcium. Gaz. de hop., Par., 53:712–714, 1910.
14. Obregia, A., and Urechio, C. J. Essais de therapie intrarachidienne par les sels de calcium dans l'épilepsie. Compt. rend. Soc. de biol., Par., 76:674–676, 1914.
15. Hjort, A. M. Influence of orally administered calcium salts on serum calcium. J. Biol. Chem., 65:783, Oct., 1925.
16. Roe, J. H., and Kahn, B. S. Calcium absorptions from the intestinal tract in human subjects. J. A. M. A., 80:1761, June, 1926.
17. Glazer, F. Psychische Untersuchungen des Blutserums Kalkspiegel. Klin. Wochenschr, 3:1492, 1924.

THE COLUMNAR ARRANGEMENT OF THE PRIMARY AFFERENT CENTERS IN THE BRAIN-STEM OF MAN

By Walter Freeman, M.D.

SENIOR MEDICAL OFFICER, ST. ELIZABETHS HOSPITAL, WASHINGTON, D. C.

(*Concluded from page 306*)

2. *The "Radix Mesencephalica Trigemini"*

Surrounding the lateral angle of the upper part of the fourth ventricle and the aqueduct of Sylvius is a fasciculus of coarse fibers arranged in crescentic fashion, which is termed the radix mesencephalica trigemini. On its inner side, sometimes intermingled with the fibers themselves are some large globoid cells with one or two processes, rarely more. These were first described by Deiters (72), who likened them immediately to the cells in the spinal ganglia. Their connection with the trigeminal nerve has been abundantly proven, and not only that, but the great majority of these cells are in relation with the third division and undergo chromatolysis and atrophy after section of the mandibular nerve. A few undergo atrophy after section of the maxillary nerve and, at least in animals, none are injured by division of the ophthalmic ramus. Van Valkenburg (75) has reported a case in which the first division was involved in a tumor mass intracranially, and in this case he found atrophy of a large number of the cells, especially from the level of the trochlear nucleus upwards. We shall have occasion to return to his finding. He considered that it proved that fibers in the ramus ophthalmicus came from these cells.

It has been shown by Johnston (73, 1909) that the peripheral processes of these cells of the mesencephalic root run with the sensory division of the N. trigeminus. Some of the cells may be seen lying between the motor and sensory nucleus of the nerve in the tegmentum of the pons. There has been much discussion as to the nature of these cells, but the problem has apparently been solved by Johnston, who showed that these cells were really homologous with the sensory cells of the spinal ganglia, and that they had remained in their primitive position, intracerebrally. In Amphioxus for example, there are no spinal ganglia, and all the sensory ganglion cells lie within the substance of the cord, situated dorsolaterally from the central canal. In cyclostomes the root has not been identified. Kappers suggests that

it may be due to the lack of any masticatory organs, but the motor V nucleus is well developed. In all higher forms these cells are found. In reptiles they lie in the roof of the mesencephalon close to the midline. These intramedullary sensory ganglion cells probably transmit proprioceptive impulses from the muscles. Examining the root from the point of view of the column, we find it situated in the lateral and dorsolateral sector of the neural tube, more or less in the location where the proprioceptive column is found in the spinal cord. Its most caudal portion at the level of entry of the trigeminal nerve occupies a different position than usual with respect to the interoceptive column. There seem to be two reasons for this. In the first place the fibers running to these cells are found on the inner or ventral side of the sensory root, apparently a primitive relationship. In the second place, referring back (p. 86) to what Johnston (8) said in regard to the lateral situation of the more recently developed centers, it will be remembered that the interoceptive system of the N. trigeminus is supposed to be a secondary rather than a primary characteristic of the nerve, owing to the development of the mouth. It would be more likely, therefore, that this system would be found to the outer side. These two bits of evidence may explain the location of the proprioceptive column to the inner side of the interoceptive. In any event the interoceptive column terminates at this level as far as I have been able to determine, while the proprioceptive column continues much farther proximal.

The processes of these cells lying in the mesencephalic root are shown to enter by the sensory V root. Many collaterals are given to the motor nucleus however, according to Cajal, and it is probable that other collaterals end in relation with other cells in the neighborhood. The sensory ganglion cells that are found in the radix mesencephalica are not the actual homologues of the cells in the main proprioceptive column of Clarke, because the former are true sensory ganglion cells, primary neurones, whereas the cells in the column of Clarke constitute the beginning of the secondary pathway. It seems more probable that the homologue of the column of Clarke is to be found in the cells that accompany the radix mesencephalica, forming a triangle in cross section to its outer side. Johnston has opened a very promising field for study by showing that the radix mesencephalica trigemini is made up of intracerebral sensory ganglion cells. The condition of the root and of the accompanying smaller ganglion cells must be investigated in cases of thalamic and of cerebellar lesions.

From the level of entry of the fifth nerve the radix mesencephalica trigemini extends forward to the anterior corpora quadrigemina. It is very early in development, being, with the fasciculus longitudinalis medialis and the roots of the third nerve the only structure which is well impregnated in the mesencephalon of the fetus of three months. Here it can be seen penetrating far into the anterior colliculus. The reason for this extensive prolongation forward has been obscure. In its forward extension the cells lie in a different neuromere, in the ophthalamic neuromere instead of in the trigeminal. Yet experimental work has failed to show that these cells are injured by division of the ophthalmic ramus of the fifth nerve to any appreciable degree. The reason for this extension to higher levels has puzzled Kappers.

The old discussion that was waged between Golgi and Cajal must be brought up again. In 1893 Golgi (78) published his observations on the "Origin of the Fourth Cerebral Nerve." The ganglion cells of the radix mesencephalica are difficult to impregnate, but in successful preparations the large cells stand out clearly as unipolar cells (some are bipolar). Golgi saw processes of some of these cells running into the velum medullare anterius and joining the root fibers of the N. trochlearis. Some of the cells were disposed along the course of the nerve, and some of the fibers of the mesencephalic root joined those of the N. trochlearis.

These statements of Golgi were criticized with more energy than tact by Cajal (2) who said that the cells were entirely devoted to the fifth nerve. Golgi admitted willingly that many of the fibers from the mesencephalic root left the pons in the fifth nerve, but suggested that the cells of the radix mesencephalica might supply both nerves. He also stated his belief that the cells of the mesencephalic root, although supplying the superior oblique muscle were not the only cells concerned in the innervation of this muscle. Cajal's opinion was taken as final however, and the question was allowed to rest.

The question of function of the radix mesencephalica trigemini was later investigated by numerous authors, especially May and Horsley, Van Valkenburg, and more recently, Kosaka (74). The last named showed that in the rabbit, section of the mandibular nerve resulted in degeneration of about 1200 nerve cells in the radix mesencephalica, whereas one hundred cells remained unaltered. Section of the ophthalmic and maxillary branches had practically no effect. In the dog, section of the mandibular division which was followed by complete degeneration of the masticatory nucleus on the same side, was accompanied by the degeneration of 546 cells out of

1010 below the level of the IV nucleus, and 205 out of 871 above this level. He found that in the monkey a few of the cells degenerated after section of the maxillary nerve in the orbit, only 71 out of 2744 cells. Section of the infraorbital nerve alone caused degeneration of only 14 cells. The opposite root in each case remained entirely intact. Therefore it seems that not all of the cells can be accounted for by a consideration of the N. trigeminus alone. It is said that enucleation of the eyeball has no effect upon the cells in the mesencephalic root, but as far as I know, no investigation of the condition of the root has hitherto been undertaken after operations upon the extraocular muscles. It has been shown by Sherrington (12) and others that the third, fourth and sixth nerves contain many afferent fibers subserving presumably muscle sensibility. These fibers run in the motor roots since there are no separate sensory roots and no sensory ganglia have been described. Golgi saw fibers running from some of the cells in the radix mesencephalica trigemini into the trochlear nerve.

The number of cells in the mesencephalic root is notably increased at the level of the trochlear nucleus and again at the level of the nucleus oculomotorius, moreover some of the large globoid cells have been found scattered in the oculomotor nucleus. Winkler states that some of the fibers from these cells join the third and fourth and possibly the sixth nerves. He suggests (14, vol. 2, p. 34): "It is therefore natural to ask if the N. trochlearis and the N. oculomotorius do not convey fibers to the radix mesencephalica trigemini, of which some return to the N. trigeminus by sympathetic connections." This explanation seems to be rather far-fetched. A much simpler explanation would be that these cells are the ganglion cells whose afferent fibers are found in the oculomotor and trochlear nerves, and that these nerves resemble still more the spinal nerves of Amphioxus that have no extraspinal sensory ganglia.

I have recently performed a series of animal experiments in order to test this hypothesis. In four cats under ether anesthesia the orbit on one side was exenterated, not only the eyeball but also the muscles, nerves and glands being removed. In a control animal the eyeball was simply enucleated. After a lapse of time the animals were sacrificed and their brain-stems cut in serial sections. One series was treated by the Marchi method, and the others studied in cell preparations. The preparations by the Marchi method showed slight degeneration in the radix mesencephalica trigemini on the side of operation at the level of the oculomotor nucleus, and on the opposite

side at the level of the trochlear nucleus. The corresponding nerves showed slight retrograde degeneration.

In the brain-stem stained with azure-erythrosin it was found that in the upper portion of the radix mesencephalica trigemini many of the large globoid cells were missing upon the side of the lesion, or were represented by shrunken, hyperchromatic structures quite apparently degenerated. This difference between the tract on the two sides of the brain was quite notable from level of the oculomotor nucleus as far as the rostral limit of the tract (Fig. 24). There was some degeneration in the tract upon the side opposite the lesion at the level of the trochlear nerve, but none below this level. The oculomotor nucleus upon the side of operation had undergone marked degeneration with chromatolysis of a large proportion of the cells. A small number of cells of the opposite nucleus had also undergone shrinkage and chromatolysis. The trochlear nucleus upon the side opposite operation had undergone practically complete degeneration, leaving intact its fellow on the side of operation. In the brain-stem of the animal whose eyeball had simply been enucleated there was no difference appreciable between the two sides in either the radix mesencephalica or in the motor nuclei. Counting the large normal-appearing cells above the trochlear nucleus revealed the following differences:

	III nucleus		IV nucleus	
Animal Number	Side of operation	Opposite side	Side of operation	Opposite
1	482	787	230	145
2	189	412	126	91
Control	665	710	187	208

There were several difficulties encountered in the investigation. In the first place the orbit of Animal 1 was incompletely exenterated. Muscle fibers were later found in the mass of scar tissue filling the orbit, and even in the second animal there were numerous motor cells intact in the oculomotor nucleus on the side of operation.

Secondly the large globoid cells were liable to undergo shrinkage during technical procedures even though the precaution of double embedding was observed. In animal 3 in which this was not done, the preparations were almost useless for study. Thirdly, the large cells often appeared in two or even three successive sections. The lower total number of cells in Animal 2 was probably due to thicker sections. In spite of these objections however, it seems to me that

on account of the well marked differences between the two sides, the results are significant. When the extraocular muscles were removed there was degeneration of a large proportion of large globoid cells in the radix mesencephalica trigemini in the rostral portion of the tract.

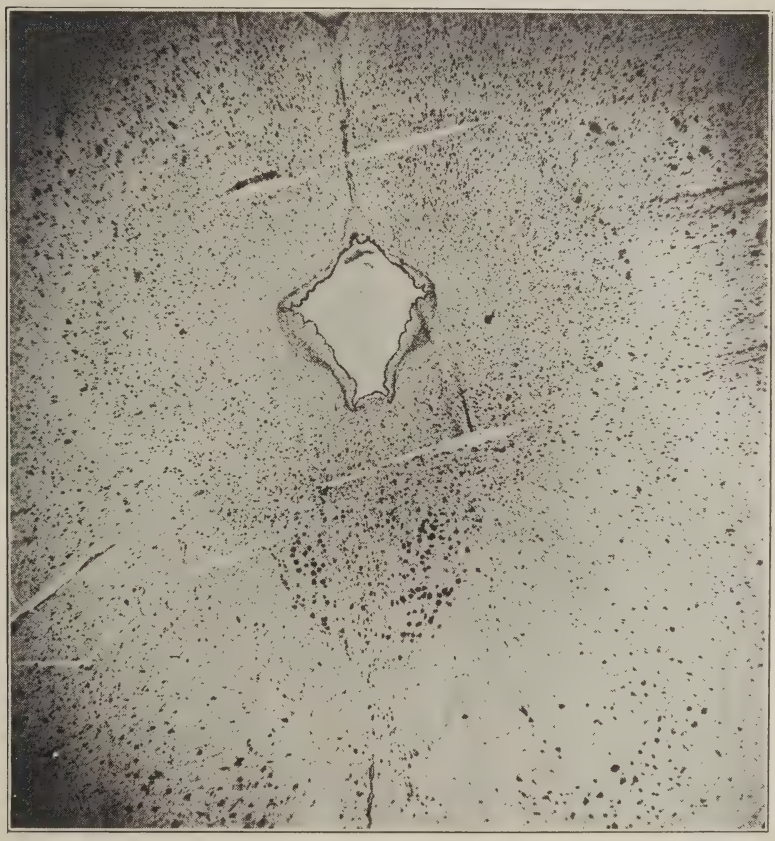


FIGURE 24. Mesencephalon of a cat whose left orbit had been exenterated, the muscles and nerves as well as the eyeball having been removed. There is severe degeneration of the oculomotor nucleus on the same side, and the large globoid cells have disappeared from the mesencephalic root. Those cells were probably concerned in the sensory innervation of the extraocular muscles.

In studying the relationship of the radix mesencephalica trigemini to the extraocular muscles the case reported by Van Valkenburg (75) may be considered. In this case a tumor of slow growth involved the first branch of the N. trigeminus while sparing the second and third

rami. At the same time however it caused complete ophthalmoplegia. In his investigation of the radix mesencephalica trigemini Van Valkenburg found that above the level of the trochlear nucleus there were 144 cells on the normal side as compared with 64 on the diseased side, and that at the upper end of the series, sections 877 to 904, there were 21 cells on the healthy side, and none at all on the other side. Since it has been shown in experimental work on animals that no cells degenerate after section of the ophthalmic division of the N. trigeminus, the degeneration of these cells was probably due to the involvement of the nerves to the extraocular muscles.

Assuming that the upper part of the radix mesencephalica contains the ganglion cells which supply the extraocular muscles with proprioceptive sensibility, we have a satisfactory explanation for the forward extension of the mesencephalic root into the ophthalmic neuromere. Moreover its prolongation into the anterior corpus quadrigeminum would place it in very appropriate surroundings from the standpoint of function.

In summary then, the radix mesencephalica trigemini is composed of intracerebral ganglion cells homologous with the intraspinal ganglion cells of Amphioxus. The peripheral afferent fibers run in the ramus sensibilis of the N. trigeminus but are not interrupted in the Gasserian ganglion. Most of them come from the ramus mandibularis but a few probably from the ramus maxillaris. There are many collaterals running to the nucleus motorius trigemini. The radix mesencephalica trigemini is the forward continuation of the proprioceptive column, and supplies muscle sensibility to the muscles of mastication. The ophthalmic and maxillary divisions are scarcely represented in the mesencephalic root.

Some of the fibers from the cells of the radix mesencephalica trigemini enter the trochlear nerve, the number of the cells in the root is increased at the level of the nucleus trochlearis and again at the nucleus oculomotorius, and some of the globoid cells lie within the oculomotor nucleus. Many of the cells in the radix mesencephalica remain unaltered after section of the N. trigeminus which causes complete degeneration of the motor nucleus; moreover, many of the cells were found degenerated in a case of ophthalmoplegia and after experimental exenteration of the orbit. Therefore it is believed that the radix mesencephalica trigemini supplies proprioceptive muscle sensibility not only to the muscles of mastication, but also to the extraocular muscles.

IV. General Summary and Conclusions.

The study of the spinal cord has been made from the standpoint of the segment and of the column, for the individual segments resemble one another so much that there is no point in considering them separately. The study of the brain-stem on the other hand began with the study of the individual nerves. These showed so many obvious dissimilarities that although certain resemblances were recognized, the nerves were described as entities. It is only comparatively recently that the division of the brain-stem into segments has been undertaken, and although there still exist many uncertainties in regard to the actual number of segments entering into the formation of the bulb yet this method of analysis has given interesting results and has facilitated an understanding of the general mechanism or fundamental architecture of the brain-stem. Still more recently there has been a tendency developed, especially by the American school of anatomists, to consider the brain-stem from the aspect of the column, thus likening it to the spinal cord. The division into somatic and visceral efferent and somatic and visceral afferent colums, separated by a sulcus limitans, has assisted greatly in the study of the primary systems. This work was begun on the lower vertebrates, but it application to the higher vertebrates, and especially to man, should yield further helpful and interesting results.

In this paper an attempt is made to apply the laws laid down for the columnar structure in the lower animals to man. There are many gaps in the defense of the thesis that will have to be stopped by further investigations, but it is believed that some of the gaps are here pointed out, and that continuing the search with a knowledge of what we are seeking, new ground will be conquered and new fields for investigation will be opened.

In the first chapter I have indicated that the fifth, seventh, ninth and tenth cranial nerves are similar in construction to the spinal nerves; each one innervates a certain cutaneous area with general exteroceptive cutaneous sensation. Each one innervates a certain area of mucous membrane with general interoceptive sensation. Each one supplies motor fibers to certain muscles which spring from the visceral motor system originally surrounding the alimentary canal. Each one carries proprioceptive fibers from the muscles it innervates. Each one contains segmental reflex fibers. The lower nerves carry gustatory fibers. The afferent divisions upon entering the brain-stem divide into two main portions, a ventral division carrying exteroceptive fibers and segmental reflex fibers and a dorsal carrying intero-

ceptive and proprioceptive fibers. The several systems of fibers run as follows:

1. To an interrupted column of large cells that is found at the inner tip of the restiform body. It is represented at one end by the nucleus cuneatus, and at the other by the nucleus sensibilis trigemini. Between these two levels we find the nucleus ventralis tractus solitarii, and two collections of cells that are called the nucleus sensibilis glossopharyngei and the nucleus sensibilis facialis. These cells receive impressions of light touch with discriminative qualities, and proprioceptive impulses underlying spatial perception. Their axones make up the lemniscus medialis.

2. To the nucleus tractus spinalis trigemini. The majority of the fibers in the spinal root of the trigeminus come from the fifth nerve, but a considerable percentage in the lower parts come from the ninth and tenth nerves, and probably also from the seventh. In its hypertrophy with respect to the other nerves, the N. trigeminus has usurped the cutaneous fields formerly supplied by the other nerves. The intracerebral course of these fibers of the N. trigeminus, conveying pain and temperature sensations, has been increased because of the necessity for coming into relation with the fixed origins of the secondary fibers. The spinal root is homologous and directly continuous with Lissauer's tract in the spinal cord. It seems probable that the pain and temperature fibers find different nuclei, for dissociation of these sensations is found not infrequently in lesions of the radix spinalis trigemini. The segmentation about the buccal orifice is shown by the progressive advance of the sensory dissociation in syringobulbia, to be as definite as that existing about the anal orifice.

3. To the nuclei of the tractus solitarius, which is merely the most prominent part of the interoceptive column. This column lies in a definite position and can be traced from the level of the nucleus sensibilis trigemini as far caudal as the closure of the fourth ventricle, and even beyond this to the pars intermedia of the spinal cord with which this tract is homologous. Two special nuclei are described in this interoceptive column, at the levels of entry of the seventh and ninth nerves. These are probably gustatory nuclei. No similar nucleus could be determined in the case of N. vagus. It is shown fairly conclusively by comparative evidence that the tractus solitarius carries fibers for general visceral sensibility rather than for taste.

4. (a) To the radix descendens nervi vestibuli. The eighth nerve is shown to be a derivation by specialization of the seventh nerve. Its acoustic division corresponds more closely to the proprioceptive

cognitive system, finding its nuclei situated laterally in the floor of the fourth ventricle, and its secondary tract in close relation with the secondary tract of the common proprioceptive cognitive and exteroceptive discriminative system. Its vestibular division exerts a special proprioceptive function and finds its reception nuclei in the Nucleus triangularis and the Nucleus tractus descendentis N. vestibuli, a column of cells which is practically continuous with the column of Clarke in the spinal cord. The secondary tract in both instances runs to the vermis cerebelli. The other bulbar nerves probably contribute fibers to this descending tract. The explanation for the long caudal extension of the tract is again to be found in the principle of usurpation.

4. (b) The afferent fibers running from the muscles of mastication and from the extraocular muscles, are not interrupted in a ganglion of the dorsal spinal type, and find their cells in the radix mesencephalica trigemini. This root is made up of sensory ganglion cells supplying muscle sensibility to the muscles of mastication and to the extraocular muscles. The cells lie in the same column as do those of the radix descendens vestibuli, that is, in the proprioceptive column.

When the location of the columns is compared at various levels it is seen that a constant relationship is maintained and that the relationship is practically identical with that observed in the spinal cord. In other words the findings in the spinal cord can be applied directly to the brain-stem, making allowances for the overgrowth of certain components of some nerves, and others of other nerves. In doing so, many of the structures that are encountered cease to have an obscure and unusual significance, and when the disguise is stripped off, become much more like the same structures in the spinal cord with whose appearance we are more or less familiar.

This study also shows that although the bulk of some intramedullary tract is made up of the fibers belonging to a particular nerve, this nerve has no exclusive rights to the use of the pathway. There are no *viae privatae* among the primary afferent systems.

In summary I append a table showing the origin, components, function, course and termination of the various mixed cranial nerves as they are believed at the present time to be represented.

I desire to express my appreciation for the willing assistance and coöperation I have received in both the clinic and the laboratory from Professor Giovanni Mingazzini and Professor Giuseppe Ayala.

TABLE I

	Nerve	Components	Type of stimulus carried	Cells of origin	Peripheral distribution and chief branches	Nerve roots	Destination in central nervous system
Spinal segment	XII Thoracic spinal	Exteroceptive	Touch [1]	XII thoracic ganglion	Skin of abdominal wall and back by anterior and posterior branches	Dorsal	Nucleus funiculi gracilis
	"	"	Pain, temperature	"	"	"	Substantia gelatinosa
	"	"	Pressure	"	Subcutaneous structures, hairs, periosteum, fasciæ of back and abdomen	"	Both of above
	"	Interoceptive	Visceral sensation	"	Abdominal organs and sympathetic connections	"	Pars intermedia cornu dorsalis
	"	Proprioceptive	Muscle sense	"	Abdominal and back muscles of segment	"	a. Dorsal column and nucleus b. Clarke's column
	"	Segmental reflex	"	"	"	"	Ventral horn
Cerebellar segment	V	Exteroceptive	Touch	G. semilunare Gasseri	Skin of face and scalp by rami ophthalmicus, maxillaris and mandibularis	Central part of sensory root	Nucleus sensibilis trigemini
	"	"	Pain, thermic	"	Skin of face and scalp (cornea receives only pain fibers)	Ventral part of sensory root	Substantia gelatinosa (thermic to Nuc. sens. b?)
	"	"	Pressure	"	Subcutaneous structures, hairs, periosteum, dura, eye tunics, in all branches	"	Both of above
	"	Interoceptive	Visceral sensation	"	Mucous membranes of mouth, nose, eye and tongue; teeth and sympathetic connections	Dorsal part of sensory root	Nuc. viscerosensibilis trigemini
	"	Proprioceptive	Muscle sense	R. mesencephalica quinti	Muscles of mastication by ramus mandibularis	Ventral part of sensory root	Locus coeruleus?
	"	Segmental reflex	"	"	"	"	Nuc. motorius V

TABLE I—*Continued*

	Nerve	Components	Type of stimulus carried	Cells of origin	Peripheral distribution and chief branches	Nerve roots	Destination in central nervous system
Anterior hindbrain segment	VII	Exteroceptive	Touch	G. geniculi	Skin of ear, external auditory meatus by posterior auricular nerve	Central part of VII sensory	Nuc. sensib. VII
	"	"	Pain, thermic	"	"	"	Substantia gelatinosa
	"	"	Pressure	"	Subcutaneous structures, hairs, perichondrium, periosteum	"	Both of above
	"	Interoceptive	Visceral sensation	"	Mucous membrane of middle ear, eustachian tube, pharynx; internal ear	Lateral part of VII sensory	Nuc. Viscerosensibilis VII (tractus solitarius)
	"	"	Taste	"	Anterior part of tongue by chorda tympani	"	Nuc. gustativus VII
	"	Proprioceptive	Muscle sense	"	Muscle sheet over face and head by motor branches	Central part of VII sensory	a. Nuc. sensibilis VII b. Nuc. descendens VIII
	VIII [2]	Proprioceptive (special)	Equilibration	GG. Scarpae	Utriculus, sacculus, canales semicirculares by cochlear and vestibular nerves	Prosimal VIII roots	Nuc. triangularis desc. VIII
	"	Proprioceptive (special)	Sound	G. spirale	Organ of Corti	Distal VIII root	NN. ventralis and tuberculum acusticum
	VII	Segmental reflex	Muscle sense	G. geniculi	Muscle sheet covering face, in all branches	Ventral part of R. VII sensory	Nuc. motorius VII
Middle bulbar segm.	IX	Exteroceptive	Touch	Ganglion superius IX	Skin of external auditory meatus and canal, tympanum by way of post auricular nerve	Central part of IX sensory root	Nuc. sensibilis IX
	"	"	Pain, thermic	"	"	"	Substantia gelatinosa Rolandi
	"	"	Pressure	"	Subcutaneous structures, hairs, perichondrium, periosteum by same nerve	"	Both of above

TABLE I—*Continued*

	Nerve	Components	Type of stimulus carried	Cells of origin	Peripheral distribution and chief branches	Nerve roots	Destination in central nervous system
Middle hindbrain segment	XI	Interoceptive	Visceral sensation	G. petrosum	Mucous membrane of middle ear, eustachian tube, pharynx and larynx(?)	Dorsal part of IX sensory	Nuc. viscerosensibilis X (tractus solitarius)
	"	"	Taste	"	Posterior part of tongue, and pharynx	"	Nuc. gustativus IX
	"	Proprioceptive	Muscle sense	G. superius	Superior constrictor of esophagus	Central part of IX sensory	a. Nuc. sensib. IX b. Nuc. descendens VIII
	"	Segmental reflex	"	"	"	Ventral part of IX sensory	Nuc. ambiguus
Posterior hindbrain segment [3]	X	Exteroceptive	Touch	Ganglion jugulare	External ear, auditory canal, scalp and neck behind ear	Central part of X sensory	Nuc. sensib. X (Nuc. vent. tr. solit.)
	"	"	Pain, thermic	"	"	"	Substantia gelatinosa Rolandi
	"	"	Pressure	"	Subcutaneous structures, hairs, perichondrium, periosteum	"	Both of above
	"	Interoceptive	Visceral sensation	G. nodosum	Pharynx, larynx, middle ear, mastoid, cells, esophagus, stomach, all internal organs, sympathetic	Dorsal part of X sensory	Nuc. viscerosensibilis X (Nuc. dors. tr. solit.)
	"[2]	"	Taste	"	Pharynx(?), epiglottis, larynx	?	Nuc. gustativus X (?)
	"	Proprioceptive	Muscle sense	G. jugulare	Muscles of larynx and pharynx by superior and inferior laryngeal branches	Central part of X sensory	a. Nuc. sensib. X b. Nuc. descendens VIII
	"	Segmental reflex	"	"	"	Ventral part of X sensory	Nuc. ambiguus

[1] Light touch with epicritic elements, localization, discrimination, etc. Simple touch may follow more than one path although one must be careful in the examination to avoid pressure. The fibers which convey pressure stimuli are widely represented in the central paths.

[2] Although the labyrinth is derived from the external skin it is so much concerned functionally with proprioceptive impulses and its central connections are so much like those of other proprioceptive systems, that it is considered here as the special proprioceptive system of the anterior hindbrain segment.

[3] The N. vagus probably represents the fusion of several segments.

APPENDIX A.

The Nervus Facialis and Its Nuclei in Elephas Indicus.

The extraordinary development of the facial musculature that forms the elephant's trunk, renders the brain of this animal especially interesting for comparative study. Through the courtesy of Professor Marburg at the Neurological Institute in Vienna, I am able to report the results of my examination of slides in that remarkable collection.

The Nucleus motorius VII has a longitudinal extent from the level of entry of the N. glossopharyngeus to that of the N. trigeminus. It is also of marked breadth and thickness, forming a prominent swelling on the ventral surface of the medulla oblongata immediately caudal to the pons. The nucleus is lobulated and contains a very large number of cells. From it the proximal motor radiculi run straight dorsally and proximally to form the genu N. facialis. This lies somewhat more laterally in the floor of the fourth ventricle than is the case in man, and two distinct eminences are formed; by the Fasc longitudinalis medialis medially and by the genu N. facialis laterally. Between them, in a few sections, lies the small Nucleus abducens. The cross-section of the genu N. facialis appears larger than the motor root at its exit. The R. sens. N. facialis enters the medulla oblongata at its junction with the pons, lying between the R. motoria N. VII and the N. octavus. This root is extraordinarily large, being more than half the diameter of the motor root itself. The entering fibers of the R. sens. N. VII break up almost immediately upon their entrance into the brain-stem. Many strands lying centrally placed in the root penetrate the R. spinalis trigemini, and some apparently do not emerge. The subst. gel. Rolandi is enlarged at the level of entry of the R. sens. N. VII and contains an unusually large number of large cells causing it to resemble the same structure as it appears just below the entry of the R. sens. N. V. A fasciculus situated mesially (the most ventral division of the entering sensory root), is quite the most prominent part of the sensory root. It penetrates the R. spin. V, runs dorsad, and then curves proximad and mesiad, coming close to the R. motor. N. VII in its distal course. This bundle of fibers can be traced directly into the genu N. facialis. The inference is that these are the segmental reflex fibers that have already been discussed in connection with the facial nerve of man (Figs. 6 and 25).

The N. octavus is smaller than the R. motor. N. VII. Its larger cochlear division enters to the outer side of the corpus restiforme. The small vestibular portion penetrates the medulla oblongata between

the R. spin. V and the corpus restiforme, reaching the N. triangularis and turning caudad in the R. desc. N. VIII. This R. desc. N. VIII appears larger than the N. vestibularis itself, and some of the fibers from the dorsal division of the R. sens. N. VII, seemed to join this root. No opinion could be formed as to the entrance into the root of fibers from other nerves. The Radix spinalis trigemini and the corpus restiforme lie relatively close to one another. Situated close to the mesial border of the corpus restiforme, more ventral than the

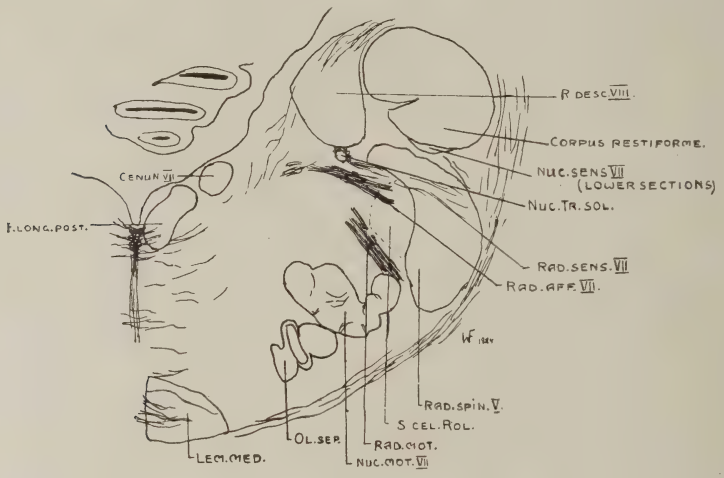


FIGURE 25. Semidiagrammatic sketch of the pons of Elephas indicus. (Weigert preparation from the collection of the Neurologic Institute in Vienna. Courtesy of Professor Marburg.) The nucleus motorius N. facialis, the genu N. facialis and the radix motoria N. facialis are all shown. The genu is larger than the outgoing fibers. More dorsally than the radix motoria is a large band of fibers that entered the pons with the sensory division and diverged mediad, running directly into the genu N. facialis. Other strands of the entering R. sens. VII are seen penetrating the R. spinalis trigemini, and some running to the gustatory nucleus. In lower sections, at the inner edge of the corpus restiforme a considerable group of cells is to be found, with some strands of entering fibers running directly to them.

Nucleus proporius tractus desc. N. VIII and distal to the main body of vestibular fibers, is a fairly large collection of cells corresponding in type to those of the nucleus sens. trigemini. Some strands of fibers entering with the R. sens. N. VII can be traced directly to this nucleus, thus establishing the probability of its being the Nucleus sensibilis N. facialis, and the homologue of the larger sensory nucleus of the N. trigeminus.

Fibers from the dorsal division of the R. sens. N. VII penetrate the R. spin. V and run to the viscerosensory column. There is apparently only one nucleus in connection with this tract. It lies

at the tip of the R. spin. V and immediately internal to the R. desc. N. vestibuli, and consists of small cells embedded in a somewhat gelatinous matrix. Since the tractus solitarius is much smaller above and below this level, this nucleus is probably the Nuc. gustativus N. VII. All the components of the R. sens. N. VII are thus accounted for with particular facility in the case of the elephant, because of the peculiar development of the parts supplied by this nerve.

APPENDIX B.

Professor Mingazzini, in whose laboratory most of this work was done and whose constructive criticism has been so helpful, has suggested that I append a description of the method for the silver impregnation of serial sections which has been used in many of the preparations from which drawings were made. Previous descriptions have appeared elsewhere, but as at present applied the method is as follows:

The material is fixed in alcohol. The entire brain of a full term fetus should be allowed to harden for six months. The method is applicable after fixation in 10 per cent formaldehyde, but there is more liability of precipitation. The pieces are embedded in paraffin, sections are cut at 10 to 20 micra, and these sections are attached to slides or cover-slips with a minimum of albumen-glycerin fixative. An excess gives rise to precipitation. After drying, the paraffin is removed by xylol, and the slides are carried through graded alcohols in the ordinary manner to distilled water. They are then laid separately, section side up, in small dishes the bottoms of which are covered by a layer 3 to 5 mm. thick, of a fresh warm 10 per cent solution of gelatin in distilled water. The gelatin is allowed to harden and upon the surface is poured a fresh solution of silver nitrate of 2 per cent strength, forming a layer that is equal in thickness to the layer of gelatin. The gelatin acts as a tissue of uniform thickness and consistency through which the silver ions can diffuse to the underlying nervous tissue. The dishes are covered and are kept in the dark for from 4 to 8 days. A longer time is not harmful and is sometimes necessary to increase the impregnation of the cellular elements.

When the impregnation is complete the silver nitrate solution is poured off and the gelatin is melted by partly immersing the dish in hot water. Upon inverting the dish the gelatin slides away, leaving the section in the bottom of the dish. The slide with the section

upon it is immediately immersed, without washing, in a mixture with the following proportions:

Silver nitrate, freshly prepared 10 per cent	3.0 cc.
Glycerin, warm	5.0 cc.
Gelatin, fresh, warm, 10 per cent	5.0 cc.
Agar-agar, warm, 1.5 per cent	5.0 cc.
Hydroquinone, 5 per cent	0.7— 2.0 cc.

The glycerin, gelatin and agar-agar solutions should be kept in the oven or on a water-bath at 40 degrees or above. The agar-agar keeps fairly well but should be filtered through cotton whenever a cloud of sediment forms. The solution of geltain must be made fresh on the day of using. The hydroquinone seems to improve in its reducing power with age. The mixture blackens in two minutes and solidifies in about ten minutes so that it must be made freshly for each pair of sections. (With a little practice, a pair of forceps in each hand, two sections can be developed at the same time.) The sections are moved about constantly in the developer until they assume a reddish brown tint that passes to grayish brown. The development is best carried out behind a screen, for direct daylight hastens the reaction to too great an extent. Too much hydroquinone results in rapid reduction with insufficient contrast, while too little results in slow development with the likelihood of precipitation. A small amount of precipitate does not interfere with histologic picture. When the desired color is reached, the coverslip is washed in warm water to remove the reducing mixture and is immersed for a minute or two in a 5 per cent solution of sodium hyposulphite. Too long immersion causes the cells to become indistinct although the fibers become somewhat more brilliantly outlined. This is followed by thorough washing in tap water, dehydration, and mounting in balsam.

The use of paraffin sections makes the control of serial sections much more easy, and it also allows the use of other stains than silver. For instance three adjacent sections may be stained by silver, toluidin blue and hematoxylin-eosin, thus giving a varied picture of practically the identical area. The silver impregnation method is especially useful in the immature nervous system because it stains black only those fiber systems that have reached a certain degree of development, leaving the others brownish or practically unstained. The varying shades of brown to black also serve to differentiate different systems of fibers where they run in close proximity to one another, as for instance in the inferior cerebellar peduncle.

BIBLIOGRAPHY

I. General Works Upon the Anatomy and Physiology of the Nervous System

1. Ariëns-Kappers. Vergleichende Anatomie des Nervensystems; Wirbeltiere und Menschen. Haarlem, de Erven F. Bohn, 1921.
2. Cajal, S. Ramon y. Histologie du Système nerveux de l'homme et des vertébrés. Translated from the Spanish by L. Azoulay. Paris, Maloine, 1909.
3. Dejerine, J. J. Anatomie des centres nervoux. Paris, Rueff, 1895.
4. Dejerine, J. J. Sémeiologie des affections du système nerveux. Paris, Masson, 1914.
5. Edinger. Vorlesungen über den Bau der nervösen Zentralorgane des Menschen und der Tiere. Leipzig, Vogel, 1908.
6. Van Gehuchten. Anatomie du système nerveux de l'homme. Louvain, 1906.
7. Head, Henry. Studies in Neurology. Oxford University Press, 1920.
8. Johnston, J. B. The Nervous System of Vertebrates. London, John Murray, 1907.
9. Herrick, C. Judson. An Introduction to Neurology. Philadelphia, Saunders, 1918.
10. Ranson. Anatomy of the Nervous System. Philadelphia, Saunders, 1920.
11. Sterzi. Anatomia del Sistema nervoso centrale. Padova, Angelo Draghi, 1915.
12. Sherrington, Charles S. The Integrative Action of the Nervous System. New Haven, Yale University Press, 1906.
13. Tilney and Riley. Form and Functions of the Central Nervous System. Hoeber, New York, 1921.
14. Winkler, Cornelius. Anatomie du système nerveux. Haarlem, de Erven F. Bohn, 1918, 1921. Vols. VI and VII of his Opera Omnia.

II. Peripheral Distribution of the Afferent Fibers of the Cranial Nerves. (The general works devote some space to the consideration of this subject. The following may also be consulted.)

15. Bolk. Die segmentaldifferenzierung des meschlichen Rumpfes und seiner Extremitäten. Morphol. Jahrb., Vols. 25, 26, 27, 28, 1898 to 1900.
16. Brouwer. Die biologische Bedeutung der Dermatomerie. Fol. neurob., 9, 1915.

A. *The Nervus Trigeminus*

17. Cushing, Harvey. The Sensory Field of the Cranial V Nerve. Johns Hopkins Hosp. Bull., 15:213, 1904.
18. Dana, Charles. The Question of Protopathic and Epicritic Sensibility and the Distribution of the Trigeminus Nerve. J. Nerv. and Ment. Dis., Vol. 33, 1906.
19. Davies. The Functions of the Trigeminal Nerve. Brain, 1907.
20. Hartmann, Edouard. La Neurotomie retrogassérienne. Paris, Doin, 1924.

B. *The Nervus Facialis*

21. Agosta. Innervation sensitive du facial. Medicina ital., 4, 1921. (Ref. in Rev. neur., 1:282, 1924.)
21a. Adelman. The Development of the Neural Folds and Cranial Ganglia of the Rat. J. Comp. Neurol., 39:19, 1925.
21b. Bartelmez and Evans. The Development of the Human Embryo During the Period of Somite Formation. (Unpublished: referred to by Adelman.) 1925.
22. Amabilino. Sui rapport del ganglio genicolato con la corda del timpano e col facciale. Il Pisani, 19:2, 1898.
23. Baudouin. Le système sensitif du nerf facial. Gaz. des Hôp., *32*:501, 1921. (Ref. in Rev. neur., 1:282, 1924.)
24. Davis, L. E. The Deep Sensibility of the Face. Arch. of Neurol. and Psychiat., 9:283, 1923.
25. Dejerine, Tinel and Heuyer. Zona de l'oreille avec paralysie faciale. Rev. neur., 1:466, 1912.

26. Dixon. The Sensory Distribution of the Facial Nerve in Man. J. Anat. and Physiol., 33:471, 1899.
27. Van Gehuchten. Le nerf intermédiaire de Wrisberg. Le Nèvraxe, 1:5, 1900.
28. Hunt, J. Ramsay. On Herpetic Inflammations of the Geniculate Ganglion. J. Nerv. and Ment Dis., 34:73, 1907.
29. Hunt, J. Ramsay. The Sensory System of the Facial Nerve and Its Symptomatology. J. Nerv. and Ment. Dis., 36:321, 1909.
30. Hunt, J. Ramsay. The Sensory Field of the Facial Nerve, etc. Brain, Vol. 38, 1915.
31. Nageotte. The Pars Intermedia or Nervus Intermedius of Wrisberg and the Bulbo-Pontine Gustatory Nucleus in Man. Rev. of Neur. and Psychiat., 1906.
32. Rinehart, D. A. The Nervus Facialis of the Albino Mouse. J. Comp. Neurol., 30:81, 1918.
33. Roger and Reboul-Lachaud. Le syndrome zostérien du ganglion géniculé. Paris méd., 11:364, 1921.
34. Souques. Syndrome du ganglion geniculé. Bull. et mém. soc. méd. Hôp., Paris, 36:146, 1921.
35. Souques and Hartmann. Les fibers de la sensibilité profonde passent-elles par le nerf Facial? Rev. neur., 1:86, 1924.
36. Weigner. Über den Verlauf des Nervus intermedius. Bull. internat. de l'Acad. des Sciences de Prague, 1901.
37. Weigner. Über den Verlauf des Nervus intermedius. Anat. Hefte, 29:97, 1905.

C. *The NN. Glossopharyngeus and Vagus*

38. Agazzi. (Herpes zoster dans le territoire de la branche auriculaire du vague.) Ospedale maggiore, 1:1922. Ref. in Rev. neur., 1:281, 1924.
39. Bruns. Multiple Hirnnervenläsionen nach Basisfraktur. Arch. für Psychiat., Vol. 20, 1889.
40. Hunt, J. Ramsay. Herpetic Inflammations of the Geniculate, Auditory, Glossopharyngeal and Vagus Ganglia. Arch. Int. Med., 5:631, 1910.
41. Van Gehuchten. Anatomie du système nerveux de l'homme. Louvain, 1906, pp. 553 ff.
42. Vernet. Syndrome du trou déchiré posterieur. Rev. neur., 1:422, 1918.

D. *The Nerves Carrying Gustatory Impressions*

43. Ariëns-Kappers. Vergleichende Anatomie. Vol. II, Part 1. (A section is devoted to this question.)
44. Ariëns-Kappers. Der Geschmack, peripher und zentral. Psych. en Neur. Bladen, Amsterdam, 1914.
45. Cushing, Harvey. The Taste Fibers and Their Independence of the N. Trigeminus. Johns Hopkins Hosp. Bull., Vol. 14, 1903.

E. *The N. Hypoglossus*

46. Froriep. Über ein Ganglion des Hypoglossus, etc. Arch. f. Anat. u. Entwickelungs, 1882.
47. Testut. Traité d'anatomie humaine. Paris, Doin, 1911. 6th Edition. Vol. 3.

III. The Primary Receiving Centers

A. *The Radix Spinalis Trigemini*

48. Cajal, S. Ramon y. Beitrag zum Studium der Medulla oblongata. 1896.
49. Breuer and Marburg. Zur Klinik und Pathologie der apoplektiformen Bulbarparalyse. Obersteiner's Arb., 9:181, 1902.
50. Gerard, Margaret W. Afferent Impulses of the Trigeminal Nerve. Arch. of Neurol. and Psychiat., 9:306, 1923.
51. Head and Holmes. Sensory Disturbances from Cerebral Lesions. Brain, 34:102, 1911.
52. Head and Thompson. The Grouping of Afferent Impulses Within the Spinal Cord. Brain, 29:536, 1906.
53. Kljatschin. Experimentelle Untersuchungen über den Ursprung des N. Trigeminus. Neur. Centralbl., 16:204, 1897.

54. Kutner and Kramer. Sensibilitätsstörungen bei akuten und chronischen Bulbärerkrankungen. Arch. f. Psych., 42:1002, 1907.
55. Marburg. Über die neueren Fortschritte in der topischen Diagnostik des Pons und der Oblongata. Deut. Zeitschr. f. Nervenheilk., 41:41, 1911.
56. Ranson. An Experimental Study of Lissauer's Tract and the Dorsal Roots. J. Comp. Neurol., 24:531, 1914.
57. Schlesinger. Die Syringomyelie. Wien, Holder, 1902.
58. Spiller. The Symptomcomplex of Occlusion of the Posterior Inferior Cerebellar Artery. J. Nerv. and Ment. Dis., 35:365, 1908.
59. Spiller, Wm. G. Remarks on the Central Representation of Sensation. J. Nerv. and Ment. Dis., 42:399, 1915.
60. Van Valkenburg. Zur Kenntnis der Radix Spinalis Nervi Trigemini. Monatsschr. f. Psych. u. Neurol., 29:407, 1911.
61. Von Solder. Der segmentale Begrenzungstypus bei Hautanästhesien am Kopfe insbesondere in Fallen von Syringomyelie. Jahrb. f. Psych., 18:458, 1899.
62. Wallenberg. Neuere Fortschritte in der topischen Diagnostik des Pons und der Oblongata. Deut. Zeitschr. f. Nervenheilk., 41:8, 1911.
63. Winkler. A Case of Occlusion of the Arteria Cerebelli Posterior Inferior. Proc. k. Akad. v. Wissensch., Amst., 17:914, 1915.
64. Bregmann. Über experimentelle aufsteigende Degenerationen motorischen und sensiblen Hirnnerven. Obersteiner's Arb., 1:73.

B. *The Fasciculus Solitarius*

65. Van Gehuchten. Le Faisceau solitaire. Le Nèvraxe, 1:73, 1900.
66. Van Gehuchten. Recherches sur l'origine réele des nerfs craniens. Jour. de neurol., 1898.
67. Van Gehuchten. (Pages 593 ff. in his Anatomie.)
68. Hirose. Über eine bulbospinale Bahn. Fol. neurob., 1916.
69. Kosaka and Yagita. Experimentelle Untersuchungen über den Ursprung des N. Vagus, etc. Okayama Igakkwai, 1905, No. 188.
70. Von Monakow. Zur Kenntnis der Grosshirnanteile. Neur. Centralbl., 36:331, 1913.
71. Tumbelaka. Konsekutive Veränderungen eines kleines Herdes in dem ventrolateralen Thalamuskern. Psych. en Neur. Bladen, 1916.

C. *Radix Mesencephalica Trigemini*

72. Deiters. Untersuchungen über Gehirn und Rückenmark des Menschen und der Säugetiere. Braunschweig, 1865, pp. 91, 92.
72a. Freeman. The Relationship of the Radix Mesencephalica Trigemini to the Extraocular Muscles. Arch. Neur. & Psychiat., 14:111, 1925.
73. Johnston. The Radix Mesencephalica Trigemini. J. Comp. Neurol., 19:593, 1909.
74. Kosaka. Zur Frage der physiologischen Natur der Cerebralen Trigeminuswurzel. Fol. neurob., 6:1, 1912.
75. Van Valkenburg. Zur vergleichende Anatomie des mesencephalen trigeminusantelis. Fol. neurob., 5:360, 1911.
76. Wallenberg. Anat. Anzeiger, Vol. 25, p. 526.
77. Willems. Les noyaux masticateurs et mésencéphaliques du trijumeau. Le Nèvraxe, 12:7, 1911.

D. *Oculomotor Nerves*

78. Golgi. Intorno all'origine del quarto nervo cerebrale. Arch. Ital. de Biologie, Vol. 19, 1893.
79. Golgi. Opera Omnia. Milano, Hoepli, 1903, Vol. 2, p. 621.
80. Winkler. Opera Omnia. Vol. 7, p. 39.

Society Proceedings

BOSTON SOCIETY OF PSYCHIATRY AND NEUROLOGY

Regular Meeting, Thursday, October 21, 1926. Donald Gregg, M.D., President, in the Chair

DEMONSTRATION OF DECORTICATED CATS

Drs. Georg Schaltenbrand and Stanley Cobb

For the purpose of physiological and pharmacological studies of mobility we intended to repeat the old experiments of Goltz, Rothmann, Dusser de Barenne, and others, who successfully removed the forebrain in higher mammals. We are especially interested in the eventual share of the striatum in mobility, and of a more exact localization of the bulbocapnine in catalepsy.

The technique of the operations is of interest because we have found it much better to operate under local anesthesia than under ether. We first give the animals a dose of bulbocapnine hydrochloride—0.02-0.03 of a gram to a kilogram of the animal's weight. After about fifteen minutes the cat becomes cataleptic; she is then placed on the operating table and shaved. The neck is first opened and small bulldog clips are placed on the carotid arteries (this part of the operation is done under ether anesthesia, for it was found that handling the vagus nerve when the animals were not thoroughly anesthetized caused death in some cases). When the carotid arteries have thus been temporarily closed the animal is turned over and the head is prepared. Novocaine, 1 per cent solution, is then injected into the scalp and epicranium, and the operation proceeds under strictly aseptic precautions. Through an enlarged trephine in the skull the dura is opened and the hemisphere laid bare. If the animal is to be made a "thalamus cat" the procedure is as follows: The gyrus fornicatus is split until the lateral ventricle is widely open, then the incision is carried down to the anterior edge of the cornu ammonis, along the outside edge of the lobus pyriformis and along the rest of the basal rhinencephalon, meeting the beginning of the incision approximately at right angles, so that only a thin layer of rhinencephalon remains anterior to the thalamus. With a blunt dissector the hemisphere is then raised and carefully removed. There remains then only thalamus and the basal portions of the rhinencephalon.

If a "striatum preparation" is to be made the lateral ventricle is opened as above and the knife circles round the outer edge of the caudate nucleus. The incised cortex is lifted carefully and the cortex of the island of Reil is removed afterwards. We have then remain-

ing only cortex in the pyriform lobe, and the striatum remains intact. After all bleeding has been stopped, by placing pieces of muscle in the brain cavity, the muscles are sewed over the wound, the skin closed with a Michel clips. About a half an hour afterwards the clamps are removed from the carotid arteries. After the operation the animal remains on the operating table restrained with head-holder and straps for from four to six hours. This is because of the marked motor restlessness which follows such operations. We remove only the cortex of one hemisphere at the time and wait for a few months before we make the second operation. At present we have one cat alive which has been operated bilaterally, and three which have been operated only on one side.

The results of these unilateral decortications are as follows: Immediately after the operation there is the hyperkinesis mentioned above. Next morning, if all has gone well, the animals are able to walk, and it is then found that they circle towards the normal side; that is to say, if the right hemisphere has been removed, the animal circles towards the left. This, however, only lasts for about one or two days, and usually by the third day the animals begin circling towards the operated side. This phenomenon persists, or at least lasts, for two or three months (this being as long as we have observed any hemidecortications). When, however, the animals are blindfolded they immediately begin circling towards the opposite side; that is, they revert to the condition that they had immediately after the operation. An animal with the right hemisphere removed, when blindfolded will circle towards the left.

Besides the above-noted locomotor phenomena it is seen that there are changes in tone. Immediately after operations, and lasting for one or two days, there is a spastic paresis of the contralateral legs; these extremities are held in strong extension. Later on this weakness and extensor rigidity diminishes, so that from three to four days after operation there is observable only a slight increase of tone in the contralateral legs and a moderate exaggeration of the extensor posture, visible when the animal is lying on its back. This, however, can be demonstrated even two to three months after operation. In the sensory realm there is found to be impairment of the sense of position on the contralateral side. This is best shown by placing the limbs in some abnormal position; the animal then is apparently unconscious of this uneasy posture and does not move. There is also impaired localization for pain stimuli. When the animals are able to run and can stand being taken outdoors where there is plenty of room, it is easily shown that they have a homonomous hemianopsia in the field opposite to the lesion (an animal with the right hemisphere removed would have a left homonomous hemianopsia). This can be demonstrated by calling the animal until it begins to follow you; then by walking in and out of the field of vision it is found that the animal loses track of you; she is lost while you are in the hemianopic field, whereas she immediately runs towards you when you get into her intact field of vision. A curious symptom, shown by some of the animals, was a great shaking of the contralateral legs

during the first few days after operation. This was begun whenever the animal started walking, and was especially noticeable if it in any way got moisture or dirt on its feet. It is apparently an exaggeration of normal shaking.

We will demonstrate three animals: The first is a maltese cat, operated on August 8, 1926. There was removal of the right hemisphere in front of and above the thalamus. The animal could then be referred to as a "right-sided thalamus cat." Immediately after operation her body arched to the left, the convex side being to the right. A few days later, when convalescent and walking about, she circled to the right and has done so ever since. When blindfolded, however, she reverses the direction of circling. She still has marked extensor tone of the left legs when lying on her back.

The next cat was operated on October 1, 1926; the right neopalium was extirpated, leaving the right striatum intact. Since the operation she has shown changes of posture of the head. In locomotion she circles to the right, but when blindfolded circles to the left. There is hyperextension of the left legs when she is laid upon her back.

The third cat had her first operation on August 4, 1926, when we removed the left neopalium without injuring the striatum. Immediately after the operation the cat circled to the right, but a few days later began circling to the left. There was contralateral hyperextension and marked shaking movements of the right legs whenever the cat began to walk. Early in September the examination showed that there was still a certain amount of right-sided hyperextension and the cat still circled to the left whenever she walked. About September 20 she began to look ill, and it was decided to operate and remove the other hemisphere before she should die. Operation revealed great hydrocephalus and some meningitis of the right hemisphere. The neopalium on the right was removed, leaving the animal a "bilateral striatum cat." She made a good recovery and shows the following important symptoms: She is able to recognize smells and eats spontaneously, but in a reflex way which causes her to eat too much; her gait is somewhat shaky and occasionally she has exaggerated shaking movements of all four legs, as if trying to shake off moisture or some obnoxious object attached to the paw; she walks about easily, often bumping into objects as if blind, and she is hyperkinetic. Her pupils react well to light, and she shuts her eyes when a bright light falls suddenly into them. It is now three weeks since the operation, and she appears to be getting along perfectly well. When given bulbocapnine she reacts with cataleptoid reaction like a normal cat.

Some other cats that we have operated on unfortunately died. Two of them were "thalamus" cats and survived the second operation; they appeared much like the one I presented this evening, but contracted pneumonia and died. Altogether, we have observed seven unilateral cats. We intend to go on and make the remaining unilateral cats into bilateral thalamus or striatum animals.

Discussion: Dr. H. C. Solomon: If the vision cortex is removed on one side without other cortical disturbance, will the animal tend to move in a circle as do the animals with removal of half the cortex?

Dr. Stanley Cobb: I believe so; I am not sure. We ought to do that as a check.

Dr. Solomon: Has any other work been done on hemidecortication?

Dr. Cobb: There have been, in the history of medicine, various decorticated animals that were kept alive after operation for a considerable period and really showed the chronic symptomatology. I have listed these in chronological order, as follows:

CHRONIC DECORTICATED ANIMALS

Magendie	1825	goat
Goltz		dog }
Rothmann		dog } Striatum
Pavlov		dog }
Dresel		dog—Thal.
Dusser de Barenne		2 cats (1 with Rhinenceph.)
Karpus and Kreidel		monkeys
Morita		rabbits
Magnus		rabbits
Rademaker		rabbits

The first, an experiment by Magendie, was not a true chronic experiment. I merely mention it to show at what an early date the physiologists began to speculate about these things. Monkeys always had shock after the operation, and did not come out of it, even though they survived as long as six weeks. Rabbits and other rodents have frequently been used but are not of as much interest as the carnivora and higher mammals. Therefore, this animal is about the eighth higher mammal and perhaps the third cat to survive this operation.

Dr. Solomon: If you just remove the motor cortex, you get a paralysis?

Dr. Cobb: A short one, yes.

Dr. Solomon: Is there paralysis after the removal of the hemicortex immediately on recovery?

Dr. Cobb: They have some weakness for about forty-eight hours; after that there is nothing.

Dr. Solomon: Is that less than if they had the motor cortex removed?

Dr. Cobb: About the same.

VACCINE THERAPY IN MULTIPLE SCLEROSIS: PRELIMINARY REPORT

Dr. Henry Viets

In July of this year we started, at the Massachusetts General Hospital, treatment of cases of multiple sclerosis with typhoid vaccine. This type of treatment has been used at other clinics since 1918 with fair results.

In 1922, Karl Crosy reported on the treatment of fifty-nine cases (Jahrb. f. Psychiat. u. Neurol., 1922, XLII, 19). He found improvement in about 30 per cent. In 1924, MacBride and Carmichael treated seventy cases with some improvement (MacBride, Henry J., and Carmichael, E. Arnold, Lancet, 1924, II, 958).

We have treated six cases with at least one course of vaccine therapy. The courses have been eight treatments, once a week, and the dose has averaged from 0.1 c.c. to 3.2 c.c. when given subcutaneously, and from 0.025 c.c. to 0.75 c.c. when given intravenously. The vaccine used was the triple typhoid vaccine from the Massachusetts State Board of Health, 1 c.c. being equal to 2,500,000,000 bacteria. The average age of our patients was twenty-five years, and the average age of onset 20.6 years. All cases suffered from spastic paraplegia and all but one had lost their abdominal reflexes. Tremor was present in all. One had speech defect, one spincter weakness, one visual defect, and three had nystagmus. Three had progressed steadily, and three showed irregular progress of the disease. Chills and fever accompanied nearly all the injections, especially those given intravenously. The fever rose in four to six hours to 101 or 102, subsiding rapidly. No patient had any definite ill effects from the treatment. Four were thought to have improved; one to have markedly improved; two others had less numbness but otherwise showed no change.

Discussion: Dr. H. C. Solomon: I have seen several of the cases in the out-patient department that have been given this course of treatment. Of those, three have reported marked improvement of the sensory symptoms. In my experience most cases of multiple sclerosis have sensory symptoms, and that is the first thing the patient complains of. In these three cases the patients have said they have had complete remission of the sensory phenomena. One patient said he had been cured three times previously by his family physician by some drug which worked within twenty-four hours and completely cured his sensory symptoms. The other two patients seemed to be enthusiastic about what had occurred. This treatment has been used elsewhere for a considerable length of time. In New York many types of nervous diseases have been treated with typhoid vaccine. As to the frequency of treatments with typhoid vaccine, it can be given every other day. We have given typhoid vaccine to patients who have had malaria treatment every day for several days to produce a chill. The chill lasts a short time and leaves no ill effects, and that is the end of the whole situation as far as typhoid is concerned.

THE NEUROPSYCHIATRIC PROBLEM OF THE U. S. VETERANS' BUREAU

In considering the neuropsychiatric problem of the Veterans' Bureau, let us cite some historical and statistical facts.

From the experience of the allies, we knew that a large proportion of our casualties would be from neuropsychiatric disease. Therefore, upon our entering the war, the army of the United States developed a Neuropsychiatric Corps which sought to eliminate, before entrance into military service, such men as were unfit from a psychiatric point of view, and to adequately care for cases developing during service. As anticipated, psychiatric cases developed rapidly, and the Federal Government was forced to throw this tremendous burden upon the U. S. Public Health Service, which was better prepared than any other department to attempt to cope with the situation. However, its facilities were wholly inadequate, and dependent as it was upon legislation by Congress to provide suitable hospitals and expert care, it could not meet the emergency as it should be met. The utilization of all available government hospitals and the leasing of civil or private institutions had to be resorted to pending the erection of special hospitals. The personnel problem was met by putting into the Public Health Service a large number of reserve officers, principally from the emergency medical officers of the U. S. Army.

With the continual increase of ex-service men requiring medical care, it was decided in 1921 to amalgamate with this work the Bureau of War Risk Insurance and the Vocational Rehabilitation Service. Accordingly, a separate bureau called the U. S. Veterans' Bureau was formed, with a director appointed by the President of the United States and directly responsible to him.

The following figures give some idea of the magnitude of Veterans' Bureau activities:

1925—Total disbursements	over $393,000,000
1926—Total disbursements	over 400,000,000

Of above figures, $40,000,000 was for maintenance of hospitals.

1925—Compensated cases	211,644
1925—Monthly disbursements of above.....	$8,000,000
1925—Personnel in Veterans' Bureau.....	27,622

Compensated cases:

Neuropsychiatric disabilities	21% (44,800 plus)
Tuberculosis disabilities	21% (45,000 plus)

In 1925, 44 per cent of all hospitalized cases were neuropsychiatric in type, there being 12,139 at the end of the year in this group.

1925—In-patient days	5,787,170
Average per capita cost.....	$4.04
Examinations of ex-service men.....	1,144,330
Men listed in Vocational Rehabilitation..	330,000

On June 30, 1925, insurance records were maintained for 552,340 veterans carrying $2,865,028,729 of insurance.

Now, as to the character and the cause of these neuropsychiatric disabilities:

At first, the preponderance was in the psychoneurotic group and later in the psychotic group. Gradual elimination from hospitals of the psychoneurotics by means of out-patient departments and the agency of the Social Service has been largely accomplished. Congressional acts which practically placed a premium on a man's remaining in the hospital have been changed or amended. When a man's compensation is continued while he is hospitalized, and ceases or is cut down upon dehospitalization, it is difficult to effectually get him onto his feet again. The psychotic group in which the preponderance now is comprised practically all variations of mental diseases but to-day in the main consists of the deteriorating psychoses, the chizophrenic group.

With regard to the origin of these cases, a certain small number relatively speaking had a traumatic neurosis (so-called shell-shock cases). The much larger proportion consisted of cases where the strain of military life, either in combat or at the rear, was poorly borne. My own personal belief is that the chief cause for these nervous and mental breakdowns was the strain of adaptation. It is probably true that many of our insane veterans would have become so if they had never entered the army, but it probably would have been under some stress or strain which they were mentally unable to handle. I give mental stress as the chief cause, but this does not preclude other causes of perhaps minor importance. I have not touched upon the question of a physical basis for mental disease because, in the absence of such evidence, one seeks the cause in the psychic realm.

We come to the important point: What can be done for these men, and what is the Veterans' Bureau accomplishing?

What can be done, under present limitations of medical knowledge, may be summarized under the following headings:

Conduct control
Physical examination and treatment
  Physiotherapy (broadly speaking)
  Drugs (when indicated)
  Occupational therapy
Mental treatment
  Occupational therapy
  Recreation
  Psychoanalysis (broadly speaking)

What the bureau is accomplishing: By means of its hospitals and out-patient departments, and by financial assistance, it is assisting its psychoneurotics on their feet. Vocational training has been of considerable help in the work, although the psychoneurotic patient is not a particularly encouraging subject.

Its chief problem in the hospitals treating neuropsychiatric cases is the care of its psychotics. Bureau hospitals of this type are sixteen in number, twelve of which are of practically new construction. Six have been finished and opened within the last two and one-half years. These hospitals are caring for 7,744 patients at present, and have a total medical personnel of 236, with a total personnel of 4,216.

The hospital at Northampton is a fair example of these newer hospitals. The following statistics apply to it:

Physicians, including administrative officers		9
Consultants		6
Graduate nurses		25
Technical personnel (O.T., P.T., X-ray, etc.)		14
Other personnel		186
		241
Patient population	433	
Graduate nurses	25	
Nursing attendants	76	

The hospital reservation comprises 282 acres, and is situated on a hill at an elevation of 425 feet, and 100 feet above the highway. The buildings are twenty-three in number, with two more to be added during the present year. Nearly all are of brick and concrete and are fireproof. The main group of buildings is at the top of the hill enclosed by a wire fence, and briefly consist of the administration building, with the administration offices in the center of the building, and admitting wards, infirmary ward, continued treatment ward, and physiotherapy department in its wings. In the clinical corridor of this building is a laboratory, large general operating room, sterilizing room, and etherization and recovery rooms. There is also a large dental clinic, ear, nose and throat room, and X-ray department. All departments are splendidly equipped with every modern means of caring for the bureau beneficiaries. In the basement of the administration building is an issue room, various store rooms, and occupational therapy rooms.

To the rear of the administration or main building are grouped six other ward buildings, the kitchen and mess halls, as well as the attendants' quarters and the new recreation building. These buildings are arranged about an oval, in the center of which is a fine ball field. The recreation building contains an auditorium seating 500, large stage, four dressing rooms, social room, smoking room, library and pool room. In its basement are bowling alleys, gymnasium, and swimming pool with shower baths.

Comparatively few ward windows are grilled.

All buildings are heated from a central heating plant, and steam is supplied to the larger kitchens. All other cooking is done by electricity. All the buildings in the main group are connected by covered walks. Water supply is from the Northampton city main, and sewage disposal is into the city system. The total cost of the plant is at present about $3,000,000.

The hospital is licensed by the State Commission of Mental Dis-

eases by authority of an act of the Great and General Court passed in 1924, so that we must comply with both the regulations of the Veterans' Bureau and the requirements of the state laws concerning the insane.

Because of certain technicalities we can receive only patients who are insane and who are receiving compensation. Most of our patients are transfers from various state hospitals in New England, which means that 75 per cent of our load is of deteriorated cases—cases which had been in state hospitals as a rule for years, and in which recovery can hardly be expected. Of the remaining 25 per cent fully half are suffering from mental disease in which deterioration is to be looked for. No patient is charged for his hospital care, but each must supply his own clothing if he is financially able. Almost all are able because, in addition to their care they receive $20 a month for clothing and luxuries. This is called an institutional award and represents $20 of the $80 or more which each totally disabled man would receive. If the patient had dependents, the balance of $60 is paid to his guardian. If the patient recovers, the balance is payable to him.

As to treatment and results. So far as numbers are concerned, the chief medical problem is the care and treatment of chronic cases; but there is also the treatment of cases which might be considered as recoverable. In the treatment of this latter group, particular stress has been laid on hydrotherapy, occupation, detailed personal attention, and medication where indicated.

In the treatment of the first and large group, we have been compelled to depend upon physical and mental hygiene which includes a reasonable institutional system of living, occupational therapy, physiotherapy, and recreation. Fortunately, treatment directed to the physical and mental condition runs fairly parallel, as every physical handicap must be overcome if the maximum mental benefit is to be received. On the physical side, there must be painstaking investigation, with suitable, energetic, and adequate treatment if physical disease is discovered. The most conscientious work on the part of the clinical service is necessary here, and the equipment of the hospital is practically complete for the application of every recognized means of treating physical illness.

On the mental side the treatment falls into four divisions:

Occupational therapy
Recreation (not to interfere with occupation)
- Entertainments
- Drives
- Bowling
- Swimming
- Music
- Baseball
- Dancing

Psychoanalysis

Psychotherapy is very limited because the ward surgeon, burdened as he is with administrative details, etc., cannot give the time desirable.

Certain results have been secured which statistical tables cannot reflect. Obviously, the number of "recoveries" we can record is very limited, but the large majority of our patients show marked improvement in such particulars as better living habits, interest in their personal appearance, improved table manners, willingness to assist on the wards, better conduct at entertainments and church service, keener appreciation of enjoyable affairs, and less discontent, and more enjoyment of life with happier adaptation to their surroundings as a whole. Of the total number of 600 patients thus far received, 84 have made a sufficient improvement to remain at home, presumably making a reasonably satisfactory social adjustment, and in several instances an economic one. The remaining patients are improved as outlined above, and many are approaching a point where they can go out on visit.

Patient activities about the hospital, under the direction of the occupational therapy department, not only serve to further their physical and mental improvement, but are the means of substantial saving to the government. The condition of the grounds is rapidly improving, made possible mainly through patient labor under the direction of our landscape architect employed part time. A nursery has been established; lawns built or completed; a sunken garden at the main gate has been constructed with plants and cement pool and fountain. All these activities are carried on directly or indirectly as occupational therapy projects, and though progress with patient labor is not so rapid, it nevertheless serves a two-fold purpose, as stated above. Other activities in which patients have been engaged successfully are as follows:

Construction of tennis courts
Construction of garages
Construction of poultry houses
Construction of piggery
Construction of ornamental fountains
Brush making
Shoe repairing
Cleaning and pressing clothes
Repairing furniture
Carpentry about hospital
Craft work

Certain features of our service might be mentioned.

The present status of our medical officers is as Civil Service employees. The administration of the hospital is directly under the medical division of the central office of the U. S. Veterans' Bureau. Admissions of patients, except in emergency, are made under authority of the various regional offices of the bureau. New patients are held under temporary commitment papers until they are examined and committed in the local district court. Examinations for this purpose are conducted by expert psychiatrists having no direct connection with the bureau. Coördination of the various bureau activ-

ities in the New England section, as well as inspections and investigations, are under the control of a chief coördinator whose office is in New York. The financing of the hospital is under a very rigid budget system.

During the past two years great advance has been made in the organization of the Medical Department of the bureau. An advisory board, the so-called medical council, has been appointed, consisting of physicians of the highest standing in the United States. Research work has been undertaken and an organization built up to carry it on. The bureau has its own magazine, the Medical Bulletin, which is contributed to by the medical officers of the service. Every medical officer is required to contribute a paper at least yearly, and from this number are selected those articles of greatest value or of most timely interest.

In conclusion, the neuropsychiatric problem of the Veterans' Bureau is precisely the same problem which every state has to meet and has been meeting for generations. In meeting this problem the Veterans' Bureau has a great advantage, in that it is not as limited in expenditure of funds as has usually been the case with the state. I believe its real problem now is to so develop its medical personnel as to secure a maximum professional and scientific interest in its work. Congress has been and is doing its share. It remains for the representatives of the medical profession in the bureau to spare no labor or pains: First, in giving the highest type of medical and nursing care for its mentally ill patients; and second, to advance the scientific knowledge of psychiatry to its utmost.

Discussion: Dr. E. O. Crossman: When I attempt to visualize the problems of the Veterans' Bureau, particularly with reference to neuropsychiatric disabilities, I realize that in Congress there are fifty-seven different committees, and the Veterans' Bureau, in the psychiatric department, has fifty-seven different problems. Dr. Pierce has presented the summary of the origin, progress, and functions of the Veterans' Bureau in an admirable manner. Perhaps I ought to elaborate on the work a bit. It is divided into three departments—neuropsychiatric, general medicine and surgical, and tubercular or respiratory diseases. There are fifty-two different hospitals in the country run by the Veterans' Bureau; there are more than 100 clinics, and between 27,000 and 30,000 cases in the hospitals all the time. The aim in Washington has been to develop in every way possible scientific medicine and many things have been done that I know have tended and are tending to make the Veterans' Bureau hospitals as good hospitals as there are in the country. The American College of Surgeons surveyed all of the hospitals about two years ago and all but four were accepted. I think all but one are now accepted by the American College of Surgeons. Dr. Pierce has spoken of various forms of treatment: the department of research, medical department, medical bulletins, etc. Our thought was that every man should be urged to write a scientific paper every year that would result in great good. It certainly has. The Veterans' Bureau has something like 1,500 full-time medical officers, between 1,600 and

1,700 nurses, and a personnel in all of about 25,000. So you can see that it is no small affair. It is a gigantic proposition and chiefly a medical proposition. There is not a problem anywhere in the Veterans' Bureau that does not have a medical slant, and our aim has been to administer with as much sense as we could develop in the care of the men entrusted to us.

Before I left Washington, a committee of three, consisting of Dr. A. L. Gilchrist, colonel in the U. S. Army; Dr. Philip B. Metz, of the Department of Research in the U. S. Veterans' Bureau at Washington, and Dr. A. K. Krause, of the Johns Hopkins University at Baltimore, Md., was appointed to study and investigate the residual effects of war gases upon the human body. This investigation will prove, I believe, to be one of the most valuable contributions to medicine that has been developed by the Veterans' Bureau, and is being done thoroughly. We have heard so much about men being gassed with a great lack of scientific knowledge to date, but the time and material now available seems suitable for definite and dependable report to the profession.

There were cases of men without number floating around with half a dozen different diagnoses. There must be a definite diagnosis because it has to do largely with the very vital question of compensation. The director authorized a diagnostic clinic in Washington, accommodating about 250 patients, and that hospital is manned by part of the staff of Johns Hopkins University and the remainder from Washington, and men are sent there from every area in the East. That has been of vast importance because when a man goes there he has every facility known to science for study and diagnosis, and when a conclusion is reached, it is final, so far as the diagnosis is concerned. We also started a small diagnostic clinic in Cincinnati with twenty-eight beds in conjunction with the Cincinnati General Hospital, and that is running along the same lines. Before I left we had practically decided to recommend another diagnostic clinic at Palo Alto, California, in connection with the hospital there. Those are some of the things that are being done along the line of settling these various cases.

You might ask how many of all these men that were in the service have really applied to the Veterans' Bureau. I have not the figures available on that proposition, but there were treated not very long ago in one month at the out-pateint clinics something like 105,000 different people; that is in addition to the work that is being done in the hospitals. So far as this country is concerned, the Veterans' Bureau is certainly our biggest medical organization.

Dr. Pierce has spoken about the expense. You, of course, all know that there are three hospitals in Massachusetts: one at Northampton, the West Roxbury Hospital, and the hospital for tuberculosis at Rutland, the latter accommodating 400. The last time I checked up there were 266 patients at Rutland, 277 at West Roxbury, and 433 at Northampton. All the Veterans' Bureau hospitals in New England are in Massachusetts. There were about 200,000 men inducted into the service from Massachusetts and, you will recall, at first the only hospital here was the one at West Roxbury. Northamp-

ton was built, and Rutland was remodelled, so that makes the three hospitals in New England.

The district office in Boston had supervision over all New England except Connecticut. Decentralization took place, and now each state has a regional office and clinic. New York has two: one in Buffalo and one in New York City. Pennsylvania has one in Philadelphia and one in Pittsburgh; but for the most part the men are cared for by their own people in their own states.

Dr. Pierce has stated that the Veterans' Bureau offers the greatest medical opportunity for research and investigation and scientific work that has ever been offered to the medical profession, and certainly if there is a better understanding of the work that is being attempted by the government throughout the country, I am sure it will be of great benefit to the profession and to the men who are unfortunate enough to be turned over to our care.

Dr. George Clymer: Dr. Pierce and Dr. Crossman have given you a very good outline of the work of the Veterans' Bureau, and I simply want to say one word in testimonial of the tremendous improvement in the work that is being done in the Veterans' Bureau hospitals. I have been fortunate in having had an opportunity to see the development of this work, as I started, in 1919, as a visiting consultant at the East Norfolk Hospital, to which ex-service men who had epilepsy and various sorts of convulsive and hysterical attacks were sent. Soon after the hospital at West Roxbury was opened I added that to my route, and since the Northampton hospital opened I have been going there also.

In the early days the work that was done in the first two hospitals was pretty rudimentary. The records were poor; patients were diagnosed, and not a great deal was done to try to help them. There were a great many psychoneurotics at that time, but very little attempt was made at constructive therapy. Now I think that anyone who cares to go either to West Roxbury or Northampton will find extraordinarily good records of the patients and excellent conditions.

There are still a great many problems in regard to the diagnosis and the treatment of these cases. There is one group that is still giving much trouble that has not been mentioned. This is the group of constitutional inferiors—the men who do not fall into the group of psychotics, or psychoneurotics. They do not make a good adjustment in the community, either socially or occupationally. They are sent to the hospitals because of various symptoms and maladjustment in their communities. After a while they are discharged because the hospitals do not feel they can do anything more for them. They do not fall into any of the groups that ordinarily can be taken care of, and in the course of time they come back again. It seems to me that this is one of the problems which the Veterans' Bureau still has ahead of it.

In this community there is another problem which may not be as great as it seems to me, but about which I feel rather strongly, and that is the problem which was emphasized only a short time ago in the case of a man who had been a patient at the West Roxbury hos-

pital where he was diagnosed as a paranoid precox. The West Roxbury hospital is not licensed to accept committed patients. He could not be committed there, and in the course of time his guardian and his family insisted that he be taken from the hospital. He was discharged from the hospital against the advice of the officials, who were powerless to hold him legally, and recently he ran amuck, seriously wounding one person and killing himself. It seems to me that this is a definite problem which is not being satisfactorily met by the Veterans' Bureau in this community.

Dr. H. C. Solomon: While our Veterans' Bureau hospitals are good, and they have improved tremendously in the last several years, the fact still remains that they are compared, I think, with the state hospitals, and that is a wrong comparison. The state hospitals are doing the best work that it is possible to do with so little money. Government hospitals are run on a more liberal allowance, but they do not get enough money to take care of the patients as well as they might be taken care of. Every time you talk about adding a man to the medical staff it is looked upon as though that meant fifty men because there are fifty hospitals. If you ask for $1,000 for a medical library, the government thinks of $50,000. The state hospital is based on a little better than $10 per capita as the ideal; in the government hospitals the ideal is about $20, but that is not sufficient to get good personnel. You cannot do a great deal of personal work with patients when you have eighty or more patients under your charge, when three hours a day are devoted to conferences and five hours a day to paper work.

Dr. Donald Gregg: Why was it that the peak of the load was understood to be ten years after the war? Am I correct in thinking that the peak of the load would fall at that time?

Dr. Pierce: I cannot tell you exactly about that. According to the acts of Congress any man who developed a neuro psychiatric disease previous to January 1, 1925, was considered to be a service connected case. The policy of the government from the start was to take care of men who were suffering as a result of war service. I cannot tell you exactly how it was computed, but it was fairly obvious that there would be a great many cases.

Dr. Gregg: Is the load decreasing now?

Dr. Pierce: It is still increasing. I do not know when it will stop increasing. For instance, we have among our 433 patients only 15 or 16 paretics and 4 or 5 cases of neurosyphilis. Dr. Solomon speaks of ideals. I think we have certain definite ideals, and as emphasizing what he said it strikes me that the amount of money which can be spent in ordinary medical and surgical work in hospitals is almost limited. Why should we discriminate against those mentally ill? Perhaps because in the first two instances you see definite, concrete results, but in our type of cases they are more difficult to see.

CRITICAL REVIEW

Prof. Sigmund Freud

"DIE FRAGE DER LAIENANALAYSE"*

By A. A. Brill, M.D.
of new york

In the introduction to this book, "The Question of Lay-analysis," the question is raised whether a layman, that is, one not a physician, should be allowed to practice psychoanalysis. The author thinks that this question is of both timely and local significance. It is timely, for hitherto, "The consensus of the wish was that no one should practice it." The demand that only physicians should analyze is seemingly a friendlier attitude to analysis which the author views somewhat suspiciously. It is of local significance because, in some countries, all healing by laymen is forbidden by law, while in others, like Germany and America, every patient can be treated in any manner and by whomsoever he chooses, and anyone may "as a quack" treat any patient, provided he assumes responsibility for his act.[1] But, in the author's native land, Austria, as well as in France, the law is preventative, insofar as it forbids anyone but physicians taking any sick people for treatment, and as neurotics are sick people and the lay-analyst is not a physician, the law seems very clear and specific. Nevertheless, the author finds some complications with which the law does not reckon, and which need some elucidation. Thus he questions whether neurotics are to be looked upon exactly like ordinary sick people, whether the lay-analyst is nothing but a layman and whether the physician in the case actually offers what one usually expects from ordinary physicians. If the doubts raised here are valid, the law should not be applied without some modifications. But, as any changes in the law will depend on persons who need not necessarily be familiar with the special features of psychoanalysis, the author proceeds to present his arguments before them or rather before a suppositious, intelligent layman. This person (a creation of his imagination), is not just a mere listener, but an alert judge, who,

* Internationaler Psychoanalytischer Verlag, Leipzig and Wien, 1926.

[1] The author is misinformed about America by which he undoubtedly means the United States.

throughout the book follows critically whatever the author presents, and does not hesitate to pick flaws and hurl argumentative questions.

The mode of presentation is very interesting and ingenious and follows the Socratic method. The author begins by describing a number of neurotics suffering from the various disturbances well known as neurasthenias, hysterias, compulsions, and phobias, and proceeds to tell how the average physician manages such cases with temporary or no success at all, and finally brings the patient to the analyst.

The "impartial" one was somewhat impatient while he listened to the description of these patients, but soon became attentive and remarked, "Now we shall see what the analyst will do with these patients whom the doctor could not help." And then follows an exposition of psychoanalysis which is not only of interest to an impartial layman, but extremely instructive even to the experienced analyst. Indeed, the reviewer doubts whether any layman but this particular one could have followed the author, who leads him through all the intricate steps of the development of his discoveries.

As the subject is unfolded, the impartial one becomes more and more interested and fascinated by the author's masterly elucidations, but by no means remains a passive listener. He thrusts at the author all the arguments that were hurled at psychoanalysis from the beginning of its existence, but the latter knows well how to dispose of them. Thus, in talking over the cathartic method, the impartial one remarks that in all probability, the effort made by the psychoanalyst brings about a hypnotic attachment, or a suggestive binding of the patient to himself, which explains the miraculous results of psychoanalytic therapy as the effects of hypnotic suggestion, except that hypnotism works much faster. The author's answer to this is very significant: "What you said about the special personal influence of the analyst is surely very noteworthy. Such influence exists and plays a great rôle in the analysis. But not the same as in hypnotism. We should surely succeed in demonstrating to you that the situations here and there are quite different. It may be sufficient to remark that this personal influence—this "suggestive" factor—is not utilized to suppress the painful symptoms as is the case in hypnotic suggestion. Moreover, it would be a mistake to believe that this factor is altogether the carrier and promoter of the treatment. In the beginning yes, but later it rebels against our analytic intentions and forces us to the most prolific counter measures. I would also like to show you by an example how little the analytic therapy has to do with

"diversion and talking it out." If one of our patients suffers from a feeling of guilt, as if he had committed a serious crime, we do not advise him to dismiss it on the ground of his definite feeling of innocence; this he already attempted himself unsuccessfully. But we remind him that such a strong and persistent feeling must surely be based on something which may perhaps be discovered." (Page 17.)

To which the impartial one retorts, "I wonder whether you could calm the patient's feeling of guilt in this way. But what are your analytic aims and what do you do with the patient?" (Page 18.)

The author then runs through the whole history of psychoanalysis. He starts by telling his listener that psychoanalysis did not originate as a philosophic system; that it has developed slowly; that every fragment of it has been subjected to heated disputes; that it was continuously modified as it was brought in constant contact with observation, and that only a few years before different expressions were used to discuss this theory. Nor could one guarantee that the present day expressions will remain as definitive. The science is still very young and there will undoubtedly be many changes and modifications. To the question why the author talks of a new psychology, when psychology and psychologists have existed for a long time, the author states that he does not dispute this but that deeper investigation will show that these great accomplishments must be ranked with the physiology of the senses, that the old psychology did not occupy itself much with the theories of the psychic life.

The impartial one then asks why the author wishes to explain the foundation of the psychic life, overlooked by all psychologists, through observation of sick people. To which the author replies that embryology would deserve no confidence if it did not readily explain the congenital malformations, and then cites the case of an obsessive patient who constantly reasons about problems which seem foolish or indifferent, and asks whether the school psychology could ever offer the slightest explanation of such case. Moreover, our nocturnal thoughts, our dreams, follow their own paths and produce phenomena which we do not understand, which look strange to us and resemble morbid products. The academic psychology does not give us any interpretation of dreams. When an interpretation is attempted at all it is put on the basis of sensory stimuli, or explained by the unequal depths of sleep of different parts of the brain. But a psychology that cannot explain the meaning of dreams cannot be of any use in the understanding of normal psychic life, and cannot claim the name of science.

A schematic description of the psychic apparatus following the author's recent formulation of the Ego, Super-ego, and the It, is given in the clearest possible manner, and then follows a very interesting discussion on the dynamics of the Ego and the It as manifested in the pleasure principle, and the principle of reality, the development of the psychosexual life as seen in the child, the castration anxiety, the penis envy as seen in the boy and the girl,—all of which is related to the history of civilization, mythology, etc.

The listener starts the fifth chapter, by saying, "I believe that I can follow your aim. You wish to show me what knowledge is necessary for the practice of analysis in order that I should be able to judge whether only a physician should be justified in doing it. But so far, very little medical was brought forward. There was much psychology, and a fragment of biology, or sexual science, but perhaps we have not come to the end?" (Page 65.)

To which the author assents by saying, "Certainly not. Many gaps must still be filled." And then asks his listener how he would imagine an analytic treatment. The latter, after putting the responsibility of his forthcoming statements on the author, gives the following: "I will assume that a patient comes to me and complains of some symptoms. I promise him a cure if he will follow my suggestions. I ask him to tell me everything with absolute frankness. Whatever he knows or what comes to his mind, and that he should not deviate from this rule, even if some of it is disagreeable to tell." (Page 65.)

To which the author adds, "Even if he thinks that that which occurs to his mind is unimportant and senseless."

The layman continues with his description of the whole treatment, and when he finishes, the author cries, "Bravo! Bravo! I see I am again exposing myself to the reproach that I have educated a person who is not a physician to do analysis." (Page 66.) And then proceeds to give the finer points of the analytic technique, interpretation of dreams and its complicated mechanisms, and showed how much practice and learning is necessary to fit oneself for the work. It would be impossible to give in a short review a detailed description of this very fascinating work.

An excellent discussion on transference is presented at the end of the chapter, in which the author shows the manner, as well as the difficulties of these mechanisms, and ends by saying, "On the part of the analyst it demands much skill, patience, calm and self-denial."

The listener begins the sixth chapter by stating that listening to

the description of psychoanalysis and all the knowledge that one needs to use it successfully, does not demonstrate to him how it can influence his judgment about treatment by laymen. For, states he, (page 85), "The neuroses are a special form of malady; analysis is a special form of treatment; it is a medical specialty. For, it is the accepted rule, that when a physician wishes to specialize in a particular field of medicine, he must have a good education in that particular specialty. He, who wants to become a surgeon, serves a number of years in a surgical clinic, as does the eye specialist, the throat specialist, etc. . . . In the same way, I would imagine the psychoanalyst would proceed. He would get the necessary education . . . etc., but I cannot see where the lay-analyst comes in."

To which the author replies, "the physician who does what you promised for him will be welcome to us. Four-fifths of those who claim to be my pupils are physicians." (Page 86.) And then goes on to blame the physicians for not having taken the proper attitude toward analysis in the past. On the contrary, they scoffed at it and tried to hurt it. (The author forgets that proportionately the same attitude was and is still taken by laymen, and psychologists, and that, as he states, his first pupils were preponderatingly, if not altogether physicians.)

A discussion about treatment in general with special reference to the treatment of neurosis then follows, in which the author claims that not only do the medical schools not give the proper interpretation of the neuroses, but that they take a false and harmful attitude toward the subject. "The physicians, whose interest for the psychic factors of life have not been awakened, are only too ready to underestimate and to mock them as unscientific." (Page 90.)

The reviewer may be permitted to say that this state of affairs is no longer as widespread as the author thinks. Most of the teachers of psychiatry no longer take this attitude, and this is particularly true in the United States where psychoanalysis has obtained a good hearing and is constantly gaining more ground in medical and academic circles.

The unprejudiced layman then becomes more or less impatient and tells the author that he seems to avoid a direct statement concerning the question of lay analysts, and adds, "It seems to me that you propose that inasmuch as physicians who wish to do analysis cannot be controlled, one should punish them, in a way out, of revenge, by taking away from them the monopoly of analysis and open this medical activity to lay people."

To which the author replies that he is not sure that his listener correctly understood his motives. That he puts the accent on the demands, that no one should practice analysis who is not entitled to it through a specific education. And to the question what his definite proposals are, there follows a long discussion on differential diagnosis, which the author admits is not always easy and cannot always be made, and states, "The responsibility for such a decision can naturally be undertaken by the physician only." In a later passage the author again states, "I demand that in every case that comes for analysis the diagnosis should be first made by a physician." (Page 110.)

On page 111 we read the following significant passage: "There is still another case in which the analyst must call in the doctor to assist him. In the course of analytic treatment symptoms preponderatingly physical may appear, in which one is doubtful whether they should be considered in connection with the neurosis, or independent of it as a disturbance of a new organic disease. This decision must again be left to the physician." To which the listener remarks: "In other words, the lay-analyst cannot dispense with the physician even during the analysis. A new argument against his usefulness." (Page 111.) This is truly an impartial way of presenting the subject. Indeed, one feels as if the author is a bit overzealous in presenting the arguments against.

The following remarks of the impartial listener are of particular significance: "Your attitude towards lay analysts now becomes clear to me. You insist upon the fact that there should be lay-analysts, but, as you cannot get around the fact of their inadequacy for their task, you bring every argument to excuse and to facilitate their existence. But for the life of me, I cannot see why there should be lay-analysts, *who, at best can only be second class therapists*.[1] For my part, I would be willing to disregard the few lay people who are already educated into analysts, but new ones should not be made, and the institutes should be pledged not to accept lay people for instruction." (Page 112.)

The reviewer may be permitted to deduce from these remarks that we have just heard the expression of Freud's own struggles with this moot question,—the impartial one expresses the author's own conflicts with the problem.

The author would agree, he states, with his critcial listener if it could be shown that this restriction would serve the interests of all

[1] Emphasized by the reviewer.

parties concerned, and proceeds to demonstrate that it would not. He states that these interests are of three kinds, the patient's, the physician's, and last, but not least, of science, and then goes on to examine every one of them. To the patient it is a matter of indifference whether the analyst is a physician or not, provided he has the necessary qualifications (?). The lay-analysts of to-day are not composed of the riff raff, on the contrary, they are persons of academic education. It would not be to the interest of the physician to incorporate psychoanalysis into medicine, as the study of medicine is a long procedure as it is, that the medical student is more and more burdened with new subjects, and that modern conditions are such that the material existence of the type of persons who study medicine should be satisfied at the earliest possible period. The studies required for the average physician do not necessarily prepare him for the treatment of the mind and he could well omit a number of subjects if he wishes to specialize in psychoanalysis, for which he needs in addition to the deeper psychology, a good education in biology, especially in the sexual life, a good acquaintance with the morbid pictures of psychiatry. Moreover, the study of analysis includes subjects which are quite remote from the general physician, such as mythology, psychology of religion, and a knowledge of literature. He could dispense with anatomy and with the knowledge of the course of the cerebral nerve fibers as well as with all germ diseases, etc., which are not of any direct help in the understanding of the neuroses.

When the author comes to the scientific interest he does not think it desirable for psychoanalysis to be swallowed up by medicine, and find its place in psychiatry in the chapter on therapy next to hypnotic suggestion, autosuggestion and persuasion. Psychoanalysis deserves a better fate; it has already done much for the sciences dealing with civilization and its institutions, such as art, religion and sociology. The use of analysis as a therapy of the neuroses is only one of its applications, and the future will perhaps show that it is not the most important one.

The author's arguments would be as plausible when applied to other science such as engineering or law. There may have been good jurists and good engineers who have not passed through all the preliminaries prescribed for these sciences, nevertheless it is hardly probable that the average student could become a good engineer, a lawyer or doctor without knowing something about all the phases of this particular science. The reviewer has never seen a medical student who loved all the subjects which were obligatory for the at-

tainment of his medical diploma. The beginner in any field of science usually dislikes the preliminaries, the medical student may chafe under the studies of anatomy, physiology, bacteriology or chemistry, but his strong desire to realize his cherished wish to become a medico impels him to accept these subjects as a part of his course.

Indeed, it is these very fundamentals of medicine which force the student to face the reality of his undertaking. For all those who wish to become medical or lay healers are imbued with an infantile omnipotence of thought which must be toned down considerably. Many cannot stand the stress of reality, and drop out, the others soon realize that medicine is a difficult study, and by the time they reach the "interesting" part of it they have acquired not only knowledge but an effective discipline and a deep sense of responsibility absolutely necessary in the study and treatment of diseases—attributes which few, if any, so-called "lay-analysts" possess. I have no doubt that abroad there are some lay-analysts, women and men of excellent character and great learning, but as far as my knowledge goes most of those who returned here from abroad as lay-analysts, after having spent there some time and considerable money, are either unfit to judge disease or have degenerated into quacks. I cannot see how any lay-analyst could submit to the author's requirements of deferring to the physician whenever in doubt and maintain himself psychologically. At best they would be considered "second raters" in the words of the impartial listener, which is surely not conducive to proper psychoanalytic esprit.

Long, long ago I learned to accept what Freud offered even before I became convinced of it from my own knowledge, for experience has taught me that whenever I thought a statement was far fetched or incorrect I soon found that I was wrong. It was a lack of experience on my part that caused the doubt. However, for many years I have tried very hard to agree with the author on the question of lay-analysts but I could not accept his views. The more I observe it in operation the less I become convinced of its usefulness and practical application. His brilliant expositions of the problem have no more convinced me than seemingly his "impartial listener" to whom he offers as a last argument the fact that "our civilization exerts an almost unbearable pressure upon us and needs a corrective," and asks whether it is phantastic to expect that psychoanalysis was destined to offer this corrective. He looks for an American who may perhaps get it in his mind to spend a sum of money to educate the social workers of his country psychoanalytically, and make out of them a salvation troupe to combat the cultural neuroses,—remarks

which elicits from the listener the exclamation: "Aha! a new sort of salvation army." To which the author rejoins, "Why not, for our phantasies always work in accordance with models." (Page 123.) A flood of students will then flock to Europe and pass by Vienna, the author thinks, because Austria has a law against laymen treating diseases. Evidently the listener takes this rather jocosely, for the author says: "You smile? I do not say this to influence your judgment, not at all. For I know that you do not believe me, nor can I guarantee that it will happen. But this I know, it can only be of local significance, laws and prohibitions will not affect the possibilities of the inner developments of psychoanalysis." (Page 123.)

In other words, with all the brilliant and ingenious arguments added to a masterful exposition of his subject, the author feels that he *has not convinced* his hearer.

I fully agree with the author that psychoanalysis will continue to develop despite all rules and regulations to the contrary, but as far as I can see there are no restrictions against psychoanalysis as a science. This is certainly true of this country. Proof: the author's hope lies here, many of his former and present pupils seem to be pleased to come to our shores. Nevertheless, I fell with many, many others that psychoanalysis as a therapy should be restricted to those who, like the author, were trained to know the whole man physically and mentally, to physicians who had a good training in neurology, psychiatry and psychoanalysis.

Current Literature

I. VEGETATIVE NEUROLOGY.

1. VEGETATIVE NERVOUS SYSTEM.

Dart, R. A. The Misuse of the Term "Viscereal." [J. Anat., LIV, 177. Med. Sc.]

The author summarizes the history of the use of the term "visceral" and concludes that the term "visceral" (afferent or efferent) can have no morphological significance in neurology apart from its limitation to the vegetative innervation of the endodermal lining of the archenteric tube and its derivatives. As such it may include presumably "afferent" elements, by means of which the viscera are brought into more or less intimate connection with the central nervous system. But as soon as the "visceral" (endodermal) elements become entangled in description with the "ectodermal" portion of the vegetative nervous system in supposed contradistinction to the so-called "somatic" nervous system, confusion is bound to result, and particularly in considering the "afferent" or sensory side. Most productive of harmful results is the extension of the "visceral afferent" conception to the study of the special sense organs, which arise in the ectoderm. It is evident, prima facie, that to call any such ectodermal mechanism "visceral" is to indulge in a loose terminology which neglects all embryological considerations. Even in the case of taste, which appears to have endodermally arising receptors and ganglion cells in all higher forms, it is definitely known that portion of the mechanism is ectodermal—and not "visceral"—in certain fishes. Not even this reservation can be made in the case of smell, which is purely somatic. It would be possible to make out as good a case for the "visceral" character of the musculature and innervation of the diaphragm, because it happens to be related to the function of respiration. Finally, Dart contends that there is no justification in morphological considerations either for the conception of a "visceral cortex," or for regarding the striatum as a "sympathetic organ."

Pottenger, F. M. Importance of Knowledge of Reflexes in Diagnosis of Pulmonary Tuberculosis. [Med. Jl. and Rec., Feb. 20, Vol. CXX. J. A. M. A.]

Pottenger discusses the innervation of the lungs, the principles of reflex action, some common reflexes in disease, sensory and trophic phenomena of diagnostic value, sensory reflex from the lung, sensory

reflex from the pleura and trophic reflexes from the lung. He says, after one has once grasped the neurology which underlies these changes and attained skill at detecting them, he has at a glance very important suggestions as to the presence or absence of past or present chronic inflammation in the lung. The trophic reflexes combined with the motor reflexes of the lung present accurate signs of the past and present history of disease in the organ.

Riccitelli, E., and Franchini, Y. Nasal Neurosis. [Sem. Med., Oct. 4, 1923.]

Spastic vasomotor rhinitis, hay fever, nasal hydrorrhea and other forms of nasal, laryngeal and bronchial neuroses, according to these authors, are a single syndrome. The reflex sneezing, etc., is merely the casual stimulus for the vagotonic or other reflex. The vagotonia, they claim, is due to some infection or intoxication. In the overwhelming majority of cases, latent tuberculosis or inherited syphilis is responsible. In their fifty cases treated on this basis, usually with minute doses of tuberculin or mercury or both, not only was the nasal neurosis cured in 80 per cent, but the general health improved notably. [Here again psychogenic factors are blindly overlooked.]

Harner, Clyde E. The Endocrinology of the Ear, Nose, and Throat. [Col. Med., Vol. XX, Aug.]

Harner states that the moral and mental makeup of both individuals and races is determined by the endocrines. The thymus plays a part in our prenatal development and then the pituitary comes to the fore and the period of growth and physical development is gone through. It is at this time when the thyroid and sexual endocrines lie dormant that we find most of the tonsil-adenoid disturbances. Also the acute inflammations and catarrhal conditions of the ear, nose and throat, including pertussis, laryngismus stridulus.

When the ovaries and testicles function we find laryngeal changes in the boy, hypertrophic turbinates, especially at the menstrual period, in the girl.

In the hyperhypophyseal state the larynx may become acromegalic. Migraine may be caused by an engorged hypophysis.

The hyperactive thyroid gives rise to few local symptoms but the hypothyroid state causes many symptoms in the respiratory tract. Conditions are found such as asthma, hay fever, large tonsils and adenoids, thickening and infiltration of the mucosa of the turbinates, larynx, bronchi and bronchioles, and sometimes chronic catarrhal otitis media. These hypothyroid individuals are unsatisfactory patients and as a rule poor surgical risks, bleeding after well performed tonsillectomies, etc. In the exudative diathesis type of child, nonbeneficial operating for removal of tonsils and adenoids has the endocrine factor for a basis.

Adrenalin may be used as treatment for atrophic rhinitis and otosclerosis. Combination of thyroid and ovarian substance may be beneficially used in treating annoying tinnitus in women at the menstrual periods or at menopause. Thyroid extract and adrenalin in acute rhinitis and the "grippy" infections makes the patient more comfortable and hastens recovery. Thyroid extract also helps chronic eczema of the ear in certain cases.

Where possible, fresh single gland substances should be used and good results reported. Then endocrine factor should be borne in mind in treating this type of cases. [Author's abstract.]

Emile-Weil, Lévy-Frankel and Juster. Nasofacial Reflex in Lung and Nervous Diseases. [Bull. d. l. Soc. Méd. d. Hôp., Vol. XVII, June 1. J. A. M. A.]

Emile-Weil, Lévy-Frankel and Juster say that excitation of the mucous membrane of the nose causes changes in the cardiac rhythm and congestion of the face. The superior meatus of the nose is stimulated with cotton and this is followed normally by congestion of the homolateral eyelid and conjunctiva, with secretion of tears and slight mydriasis. In acute and subacute pulmonary affections, the reflex is intense on the side affected. In unilateral chronic pulmonary disease, the congestive reflex is variable but the pupillary mydriasis on the affected side is constant. In neuralgia, the conjunctival and lacrimal reaction is exaggerated, and in liver affections the congestive reflex is very rapid and intense. In tabes with Argyll-Robertson pupils, the pupil reflex does not occur, but it is present when these ocular signs are absent.

Pottenger, F. M. A Discussion of the Etiology of Asthma in Its Relationship to the Various Systems Composing the Pulmonary Neurocellular Mechanism with the Physiologic Basis for the Employment of Calcium in Its Treatment. [Am. Jl. of Med. Sc., CLXVII, 203.]

In determining the etiology of asthma, one must consider the susceptibility of the individual patient to causative agents, because of (1) hyperirritability of the bronchial division of the vagus nerve and general vagotonia as a rule, (2) a relative increase in the potassium as compared with the calcium-ions of the cells of the bronchi, (3) changes in the incretions which disturb the equilibrium of the nervous mechanism or of the ion content of the cell, and probably of its colloidal phases, especially the thyroid, pituitary and parathyroid glands. It is also necessary to consider the possibility or specific sensitization to pollen, animal emanations or foods. Inflammations and other forms of irritation which cause reflex vagus activity, such as those involving the nose, sinuses, gastrointestinal tract, genital system and the lung may lead to asthma. Physical, chemical and climatic irritants must also be considered.

The paroxysms of asthma may be relieved by atropin, which inhibits the vagus mechanism or by stimulation of the antagonistic sympathetic system. Adrenin is also successful in the treatment of the paroxysms, inasmuch as it restores the sympathetic parasympathetic equilibrium. The attacks have been observed to regress during the toxic stage of acute toxemias accompanying tonsillitis, influenza, pneumonia, typhoid fever and tuberculous exacerbations. This effect was probably due to the toxins stimulating the sympathetic mechanism and thus counteracting the vagus effect.

It is known that nerve stimulation results in cellular changes resulting in the elaboration of certain substances which enter the blood stream. The effect may be due to colloid changes. In asthma, the parasympathetic activity prevails, which presupposes a relative increase in potassium as compared with calcium-ions in the cells. The hypersensitive cells which are responsible for the reaction of anaphylaxis present changes in colloid arrangement, which result in a shifting of the ion equilibrium. This is manifested by a decrease in the sympathetic action, associated with a relative deficit in calcium-ions, increased permeability of the cell membrane and associated hyperactivity on the part of the parasympathetic nerves. Many asthmatic individuals suffer from other manifestations of protein hypersensitization, such a hay fever, urticaria and eczema and present evidence of parasympathetic hyperactivity, in the form of an increase in oculocardiac reflex, bradycardia, hyperchlorhydria and spastic constipation. In many cases there is a familial history of similar conditions. Hyperirritability of the neurocellular mechanism of the bronchi probably underlies the asthma, whatever the precipitating factor may be.

Treatment should be directed toward relaxing the bronchial spasm and relieving the bronchial secretion by changing the electrolytic content of the cells. Pottenger administered calcium in order to restore the neurocellular equilibrium. The dose was empirically determined; small doses were first given (5 c.c. of a 5 per cent solution) intravenously. The dose was increased to 10 c.c. if necessary; the treatment was repeated as indicated. The patients were kept in bed. When the drug was injected slowly, untoward effects were noted. A slight facial flush was noted and the patient reported a sensation of warmth over the abdomen. The blood pressure increased from 5 to 10 points following the injection. but usually returned to normal within thirty minutes. The pulse rate decreased from 10 to 20 points per minute and later returned to normal. When the injections were made rapidly, the patients complained of intense heat, profuse perspiration, constriction of the throat and nausea for about thirty minutes. A burning sensation in the rectum was also noted. One patient developed aphonia.

The action of calcium resembles that of adrenin or of stimulation of the sympathetic system. The result of adrenin in asthma is satisfactory

but transitory. It is hoped that calcium will prove of more permanent value. The dosage must be determined in each individual case.

Pottenger employed calcium in cases of bronchial asthma precipitated by bacterial infection. Both the spasm and the bronchial secretion were relieved. The results were prompt and satisfactory. The relief of heart strain was marked; it was manifested by a decrease in the pulse rate.

Calcium therapy is also indicated in other conditions accompanied by hyperirritability of the parasympathetic system, such as asthma, hay fever, urticaria, serum disease, spastic colon and diarrhea.

Hekman, J. Treatment of Asthma. [Ned. Tijd. v. Gen., Dec. 15, Vol. LIX. J. A. M. A.]

Hekman calls attention to the invariable presence of streptococci in large numbers—with other bacteria variable—in the sputum from 300 cases of bronchial asthma in different parts of the Netherlands. In nearly every instance the asthma had developed in direct connection with some infectious disease, generally in childhood. Hence he ascribes the asthma in these cases to some inflammatory process in the smaller air passages, and treats with a vaccine made from the sputum. He reports encouraging results even in the patient's usual environment. Intractable cases sometimes yielded to change of scene, tuberculin treatment, protein therapy or turpentine fixation abscess. Asthma from anaphylaxis is rare in comparison to this form.

Veitch, J. Treatment of Asthma with Combined Peptone and Vaccine. [Brit. Med. Jl., Jan. 5, 1924. J. A. M. A.]

The solution used by Veitch was in three strengths: A—5 c.c. of 6 per cent solution = 0.25 gm. peptone + 235 million organisms mixed catarrhal vaccine. B—5 c.c. of 10 per cent solution = 0.5 gm. peptone + 940 million organisms mixed catarrhal vaccine. C—10 c.c. of 10 per cent solution = 1 gm. peptone + 1,880 million organisms mixed catarrhal vaccine. The injections were given every seven days: for the first four weeks half a tube of A solution per week, for the second four weeks half a tube of B solution per week, and so on, increasing in strength of dosage. The injections were given intramuscularly in the so-called painless area just below the anterior superior spine of the ilium. Generally the results were good.

Ramirez, M. A., and St. George, A. V. Etiology of Asthma. [Med. Jl. and Record, Jan. 16, Vol. CXX.]

These observers claim that all persons react to histamin when injected. The reaction is two or three times more intense—speed; extent; wheals (from 15 to 30 mm. in diameter), intensity of the reaction—in persons who manifest symptoms of endogenous asthma. The treatment of asthma with histamin is therefore a corollary and is here reported as of value.

Bereterviде, E. A., and Pozzo, F. Asthma in Children. [Sem. Méd., Feb. 14, 1924.]

Signs of inherited syphilis in all but one of the nineteen examined for it were found in the 22 cases reported of bronchitis of the asthmatic type in children. Under treatment for syphilis all were benefited. The tracheobronchial adenopathy was accompanied by an abnormal width of the aorta hence probably luetic.

Duke, W. W. Treatment of Hay-fever Asthma and Other Manifestations of Allergy. [Am. Jl. Med. Sc., Nov., Vol. CLXVI.]

Here "allergy" is the "nigger in the wood pile." Asthma, hay fever, the dermatoses, the gastrointestinal, urologic and neurologic symptoms, urticaria, angioneurotic edema, hypotension, are all manifestations. Five different lines of treatment are suggested: (1) avoidance or removal of the specific cause of illness, (2) or of contributory causes, (3) specific protein treatment, (4) nonspecific protein treatment and (5) symptomatic treatment.

Storm van Leeuwen, W., Varekamp, H., and Bien, L. Bronchial Asthma and Climate. [Klin. Woch., Vol. III, March 25. B. M. J.]

W. Storm van Leeuwen, H. Varekamp and L. Bien refer to the well known fact that bronchial asthma occurs in certain cases when the patient has inhaled substances which are harmless to normal individuals—for example, pollens, ipecacuanha, castor oil, or effluvia from horses or other animals. They believe that there are other unknown colloid substances which may produce asthma in "sensitized" patients, and they find that the removal of such patients to a mountainous country has an immediately beneficial result in many cases. Other factors beside altitude have to be considered, including air pressure, humidity, temperature, and amount of sunlight. In Holland there are three principal zones: (1) the dunes and sea coast; (2) the banks of the larger rivers; (3) the drier sandy areas. If patients from the coast are sent to the third zone they improve, while those from the second zone do not. The authors determined to send three patients to various Swiss mountain stations, and observations were made at Basle (100 meters) and at various mountain stations, the highest being St. Moritz (1,800 meters). The three patients were natives of the different climatic zones. Each was carefully examined daily (auscultation and blood pressure). The third patient (from Groningen) did not improve as rapidly as the others, but eventually, when at St. Moritz, all were free from symptoms of asthma and of bronchitis. The authors conclude that (1) the majority of cases are due to inhalation of certain "asthmogenous" substances of usually unknown nature; (2) these unknown substances are seldom found in mountain stations, so that at 1,200 to 1,800 meters the majority of patients are free from symptoms; (3) sojourn in mountainous country does not cure asthma.

Galup, J. Asthma and Loss of Vagus Sympathetic Balance. [Presse Méd., Vol. XXXI, June 16.]

In this chase after the causes of asthma the author found the oculocardiac reflex exaggerated in 35.52 per cent of 152 asthma patients, and inverted or abolished in 34.88 per cent. Thus in 70 per cent the balance between the vagus and the sympathetic was upset, one or the other being predominant at the moment. The oculocardiac reflex can thus serve as a guide for symptomatic treatment.

Calderon, L. F. Essential Asthma. [Rep. d. Med. y. Cir., March, 1923. J. A. M. A.]

Calderon has encountered three cases of intermittent and periodical dyspnea during expiration, in young women, with a slightly febrile temperature at first. The only physical signs were slight cyanosis of the lips and variable sibilant râles scattered through both sides of the chest. There was little or no dulness on percussion. Each paroxysm of the asthma exhausts the patient, but in the intervals she attends to her usual duties, although weak. The differential diagnosis is still obscure, and no treatment has been effective.

Lumsden, T. Respiratory Centers. [Jl. of Phys., Vol. LVIII, Aug. J. A. M. A.]

Rhythmical respiration in the cat and probably in all mammals, Lumsden asserts, is managed by an inspiratory mechanism, the apneic center at the level of the striae acousticae; by an expiratory center just below this level; and both these centers are controlled by a higher center, pneumotaxic center, in the upper half of the pons. The gasping center near the apex of the calamus scriptorius is probably a relic of some previous respiratory mechanism and does not appear to influence true rhythmical breathing of normal type, although it may or may not be a relay in the tract of apneic impulses to the inspiratory muscles.

Pottenger, F. M. Calcium and Asthma. [Cal. St. Jl. of Med., July, Vol. XXI.]

Pottenger claims now that the patient's reaction is an expression of a hyperactivity of the vagus potassium. Whether this is actually a hyperirritability of the sympathetics and a lessening of the cellular content in calcium or a hyperirritability on the part of the vagus and an increase in the potassium content of the cell is not yet certain, but that there is a relative hyperacidity of the parasympathetics and of the potassium content of the cells is evident, not only from the symptomatology, but from the measures that are used to combat the paroxysms. Calcium is definitely identified with sympathetic, and potassium with parasympathetic action. Reasoning from this concept of the neurochemical control of activity in the bronchial tissues, Pottenger tried to relieve the paroxysms in a severe case of asthma by producing a relative increase in the calcium content of the body cells.

The remedy was given in the form of calcium chlorid, in doses of 5 c.c. of a 5 per cent solution, intravenously. After the second dose, which was given two days after the first, improvement was noted, and after three doses she was entirely relieved of paroxysms. In each of three other cases the paroxysms have been completely relieved.

Trabaud and Charpentier. Treatment of Asthma. [Bull. d. l. Soc. Méd. d. Hôp., Vol. XLVII, March 23. J. A. M. A.]

Trabaud and Charpentier report a case of asthma recurring at infrequent intervals from the age of six. Native of a sheep country, the young man one day was employed at a wool carding machine, and in fifteen minutes he was seized with an attack of unprecedentedly severe suffocation. Other attacks followed, and he had to stop this work. During the war he was forced to work for the Germans. He remembered this wool carding machine experience, and he ripped his mattress and buried his head in the wool filling. A few minutes later he was seized with such a violent attack of asthma that he was sent to the hospital. Six months later, having improved, he again resorted to the means that had served him so well before, with the same results, so he was permanently exempted from forced labor for the enemy. Since that time he has been subject to asthmatic attacks of varying severity and at irregular intervals, until given the cutaneous reaction treatment with wool applied to a scarified place on each deltoid region. At the first application, urticaria developed instantly around the area, but soon disappeared. The dyspneic shock followed some hours later. The local and respiratory reactions grew less pronounced, and in two months the asthma seemed to have been entirely cured. He can now handle and sleep on wool without harm.

II. SENSORI-MOTOR NEUROLOGY.

3. SPINAL CORD.

Woltman, Henry W. Neurologic Aspects of the Early Diagnosis of Pernicious Anemia. [Annals of Clinical Medicine, Vol. I.]

A tentative diagnosis of pernicious anemia can often be made on neurologic evidence alone. About 12.7 per cent of the patients come to be relieved of symptoms primarily due to involvement of the nervous system; 1.4 per cent have these symptoms before anemia is present. Ordinarily they do not appear until an average of about ten and a half months after the appearance of anemia. While both position of joint and vibratory sensibilities are conducted up the posterior column of the cord, the former is not so often lost as the latter. Sometimes pain, tactile and temperature sensibilities are also lost; however, these forms of superficial sensation are usually preserved almost intact. Hamilton and Nixon have shown that if the terminal ramifications of the peripheral nerves are examined, multiple neuritis can be demonstrated. This was manifest

clinically in 4 per cent of our cases and explains the paresthesias these patients so often complain of much better than does the cord involvement. In about 80.6 per cent of patients with pernicious anemia the nervous system is affected. The characteristic findings are loss of vibration and joint sensibility. Mental changes are striking, and some observers assert that they can diagnose pernicious anemia on the mental changes alone. The psychosis is usually of the so-called symptomatic or infection-exhaustion type. Although about 25 or 30 conditions are said to give rise to combined sclerosis, only a few of practical importance are observed in this part of the country. Pernicious anemia and arteriosclerosis of the nervous system are often found in the same patient. In arteriosclerosis, as in pernicious anemia, we often find combined sclerosis and sometimes multiple neuritis, but not so frequently. Certain findings, however, should put us on guard, and we must make allowance for these in examining the nervous system for evidence of pernicious anemia. Small, irregular, poorly reacting pupils are often found in arteriosclerosis and are not common in pernicious anemia. Arteriosclerosis of the fundus usually means arteriosclerosis of the central nervous system; the reverse is not always true. There is a characteristic mental change in arteriosclerosis that is evident on examination and often helps to differentiate the two conditions. A presumptive diagnosis of pernicious anemia can often be made on the neurologic picture alone before anemia has put in its appearance. Finally, the examination of the nervous system often helps in a very practical way in deciding whether the patient has a primary idiopathic type of pernicious anemia or some other type of severe anemia. [Author's abstract.]

Dufour, H., and Duchon. Multiple Sclerosis and Syphilis. [Bul. d. l. Soc. Méd. d. Hôp., Vol. XLVII, June 22.]

In this patient with a clinical multiple sclerosis syndrome the Wassermann reaction of the c.s.f. was positive and improvement followed bismuth treatment. There was no history of syphilis and no other positive evidences.

Brown, Earle G. Poliomyelitis Epidemic in Topeka. [Jl. Kan. Med. Soc., Vol. XXIII, Nov.]

Thirty-six cases of acute poliomyelitis were reported in Topeka over a period of 57 days, from July 30 to September 25, 1923. Thirty-four of the 36 cases were of the white race. But one case resulted fatally. Eleven of the patients were under six years of age. Eight were twenty years of age or over. Four of the 8 were male and 4 females. By occupation, 12 were students. Sore throat was a prominent onset symptom in 20 cases. Nine patients had paralysis of the left leg; 5 of both legs; 4 of the right leg; 3 of the left arm; 2 of both legs and arms; 2 of the right arm; 2 of the left leg and left arm. Contact could be

established in but one instance. No two patients secured milk from the same dairyman. [Author's abstract.]

Bouttier and Bogaert, Van. Spinal Cord in Infantile Poliomyelitis. [Ann. d. Mèd., Vol. XIV, Aug.]

A careful clinical anatomical study by the late deceased neurologist Bouttier and colleague of seven normal cords with comparative material from the cord in a case of infantile poliomyelitis in a boy, aged 15. The acute phase began at the age of 10, and for two years the boy was unable to move arms or legs or to sit up. Then he began to improve somewhat, notwithstanding the uniformly distributed destruction of the motor cells in the anterior horns. The lateral column of sympathetic cells was intact throughout, and the muscles of the trunk were comparatively normal. Bouttier queries whether the spinal sympathetic system might not have been responsible for the partial resumption of motor function.

Krabbe, Knud H. Acute Anterior Poliomyelitis. [Review of Neurology and Psychiatry, 1919.]

Author describes two cases of acute poliomyelitis, in that he draws the attention to that fact that this disease can begin earlier and later in the life than ordinarily accepted and, therefore, can make some difficulties in diagnosis. The first case was a little girl in whom the disease began as she was two months old. During the disease there appeared gangrena of some of the fingers. The other case was a man, aged 54 years. There was some diagnostic difficulties against the diagnosis of thrombosis of the anterior spinal artery. In both cases the patients died and microscopical examination of the spinal cord confirmed the diagnosis: acute anterior poliomyelitis. [Author's abstract.]

Berardinelli, W. Acute Anterior Poliomyelitis in Adult. [Braz. Méd., June 9, 1923.]

This patient, a young adult, had a flaccid paralysis of both hands and one leg, and a severe cephaloplegia.

Adams, D., Blacklock, J., Riddell et al. Disseminated Sclerosis. [B. M. J., Nov. 10, 1923.]

The Royal Medico-Chirurgical Society of Glasgow held a discussion on the pathology, symptomatology, and treatment of disseminated sclerosis.

Dr. Douglas Adams in an opening paper briefly reviewed the literature of disseminated sclerosis, and referred more particularly to recent results obtained in an investigation which was being carried out in the Pathological Department of the University and Western Infirmary of Glasgow in collaboration with Drs. E. M. Dunlop, J. W. S. Blacklock, and J. A. W. McCluskie. In a considerable number of cases paralysis had been transmitted to rabbits by the injection of blood or spinal fluid from patients

suffering from the disease, and had been passed from rabbit to rabbit, both by direct inoculation and by passage through culture. Spirochaetes were found in the organs of seven of the inoculated animals both by dark ground examination and by staining, though examination of the cultures employed yielded negative results. These results were regarded as confirming the view that the diease was infective in origin. Emphasis was laid on the necessity for early diagnosis, and in this connection the value of the colloidal gold reaction was urged. The results of intensive antispecific treatment of 50 cases were referred to. In many cases considerable clinical improvement had been noted and this had coincided with a modification of the colloidal gold curve in a negative direction. In the majority of cases the subsequent absolute or relative freedom from relapses during a period of three years was striking. The investigation was being continued under a grant from the Medical Research Council.

Dr. J. W. S. Blacklock described in more detail the various experiments performed, and said that when blood or spinal fluid from cases of disseminated sclerosis had been inoculated directly into rabbits about one-third of the animals developed nervous symptoms. Emulsion of the central nervous system of these paralyzed animals produced nervous symptoms in a proportion of cases on inoculation into other animals either directly or after passage through Noguchi's medium. No nervous symptoms had been noted in over 200 normal control animals kept under observation for periods varying from four months to over a year, nor had paralyses developed in animals inoculated with various protein substances. He considered it probable that a virus was present in the blood and cerebrospinal fluid of these patients which was capable of existing in the central nervous system and of producing paralysis in a proportion of the animals inoculated. The pathological lesions that had been noted in the central nervous system of the inoculated animals were: (1) Cellular infiltration, chiefly under the ependyma of the ventricles. (2) Degeneration of nerve tracts—this had been observed only in one animal which had lived for over a year after the onset of paralysis; the other animals which had shown nervous symptoms had lived for too short a time after the onset of such symptoms to allow definite pathological changes to occur. (3) Petechial hemorrhages. (4) Multiple lesions of the nature of softening.

Dr. Brownlow Riddell referred to the frequent occurrence of slight and transient eye symptoms in the early stages of the disease, and urged the importance of a critical interpretation of such symptoms in a case presenting no other apparent clinical feature. The surprisingly slight attention paid by the average patient to transient eye symptoms, with the speedy recovery therefrom, and the absence of any other sign or symptom, combined to present a clinical picture often underestimated or attributed to a functional, hysterical, or digestive origin. Dr. Riddell then discussed in detail the various symptoms, including diplopia, acute

retrobulbar neuritis, nystagmus, and optic atrophy, and described a number of illustrative cases.

Professor C. H. Browning, in commenting on the results of the experimental work, said that the small proportion of successful transmissions was not surprising in view of the insusceptibility of both man and animals to the disease. He emphasized the fact that the virus persisted in the culture media which had been inoculated with blood from cases and kept over long periods in the incubator, and was inclined to the opinion that the pathogenic agent was a living organism or the product thereof. He then referred to the value of the colloidal gold reaction as a means of early diagnosis and of controlling the results of treatment.

Professor Robert Muir, in referring to the pathological and histological changes in the disease, said that while they were very definite they yet presented certain peculiar characteristics. The essential features at an early stage were (*a*) a disappearance of the myelin sheaths, (*b*) a persistence of the axis cylinders, and (*c*) an absence of Wallerian degeneration. These changes occurred in patches which were often sharply cut off, as though by a knife, from the surrounding healthy tissues. The process was peculiar and quite unlike a true sclerosis. The colloidal gold reaction in the cerebrospinal fluid he considered would mark a real advance, if completely established, and would prove of great assistance in controlling treatment. Referring to the etiology, he was of the opinion that, while a great many facts supported the infective theory, the state of the experimental work was as yet too uncertain for complete proof. While hopeful, it was not conclusive.

5. CEREBELLUM; PONS; PEDUNCLES; MID-BRAIN.

Van Bogaert, L. Inferior Syndrome of the Red Nucleus. Psychosensorial Disturbances of Mesencephalic Origin. [Revue Neurologique, An. 31, T. 1, No. 4, p. 417.]

The patient, fifty-nine years old, suffered a sudden shock without loss of consciousness after which she had a staggering gait and diplopia. That night she had visual hallucinations, chiefly animals. The examination showed increased tendon reflexes on the left side and a positive Babinski reflex on the left. There was a ptosis on the right eye with a complete third nerve palsy. The motor trigeminus was normal but the sensory part was slightly affected. There was some dysmetria on the left. [Camp, Ann Arbor.]

Pötzl, O., and Schloffer, H. Cyst of Caudate Nucleus. [Med. Klinik, Jan. 4, Vol. XXI.]

An interesting clinico-pathological report from the Prague clinic of a patient with a cyst of the left caudate nucleus. This patient with choked disks and much deterioration also showed pressure on the frontal parts

of the cortex, near the frontopontine radiation, and motor disturbances. An affection of the striate body was assumed. A cyst was found which contained 86 c.c. of fluid. A communication between the lateral ventricle and the cyst was established by introduction of a tenotome along the needle.

Herman, E. Symptomatology of Sydenham's Chorea: Chorea with Bilateral Papillary Edema: Right Sided Hemichorea with Right Hemiplegia and Intermittent Aphasia. [Revue Neurologique, An. 31, T. 1, No. 4, p. 425.]

The first patient, eighteen years old, had a right-sided chorea lasting about three months. It improved but the movements recurred about a month later. This time the ocular fundi showed blurring of the disc margins, venous congestion and hemorrhages. These findings persisted for about two weeks. The second patient was seventeen years old. There was a history of chorea at the age of six but the present attack was attributed to grief from the loss of her mother. The choreic movements occurred in attacks lasting an hour or so. The right side would become weak and she would also have spells of short duration in which she would become mute, without loss of consciousness. (Camp, Ann Arbor.)

Marque, A. M., and Camauer, A. F. Wilson's Disease. [Prensa Méd., Jan. 20, 1925.]

An early report from the Argentine of this syndrome illustrated with six photomicrograms. In spite of the fact that the Wassermann had been positive syphilis was not thought to be the direct origin of the striatal lesions. The liver was small and abnormally hard, but did not show any acute inflammatory lesions.

Walshe, F. M. R. Decerebrate Rigidity in Man. [Encéphale, Feb., Vol. XX. J. A. M. A.]

Walshe reports a case resembling Sherrington's decerebrate rigidity in a woman, aged twenty-four, with a double hemiplegia. Necropsy revealed a typical suprapituitary tumor filling the third ventricle. The compression exerted by the tumor as well as by a secondary hydrocephalus were probably responsible for the symptoms of the decerebrate type. He concludes that the physiologic signs of experimental decerebrate rigidity are similar to those in pyramidal spastic conditions.

Papadato, L. Microscopical Findings in Wilson's Disease. [L'Encephale, Vol. XX, Jan.]

Clinicopathological report of a case of Wilson's disease, in a young man, showed diffuse lesions predominantly localized in the lenticular nucleus, and affecting the whole neuroglia. The changes in the liver were interpreted as resulting from the lesions in the lenticular region. These were ascribed to a probable antecedent encephalitis.

Wimmer, A. The Striate Syndrome in Congenital Encephalopathies. [Revue Neurologique, An. 31, Vol. II, No. 4, p. 316.]

In one case the symptoms were bilateral and the striate lesions were attributed to asphyxia at birth. The upper extremities were little affected. In the lower extremities the tendon reflexes were exaggerated but there was no Babinski reflex. The patient was an imbecile. In a second case, a girl aged fifteen years, also an imbecile, the symptoms were confined to the right side except for some tremor of the left thumb. In this case the lesion was regarded as dysplastic and due to some hereditary defect. [Camp, Ann Arbor.]

Foix, Ch. On Tonus and Contractures. [Revue Neurologique, An. 31, T. 2, No. 1, p. 1.]

Foix defines tonus as "a state of active tension of the muscles, permanent and involuntary, and variable in its intensity according to the various associated or reflex activities that may reinforce or inhibit it." Electromyographic studies of muscles in voluntary contraction and in static contraction were made with the Einthoven galvanometer and showed distinct differences. In the static contraction the oscillations were small and rhythmical. The author describes two distinct types of contractures: pyramidal and the extrapyramidal. The latter are further divided into the decerebrate rigidity, Parkinson rigidity, and pallidal rigidity. From the study of the reflexes contractures are classified as tendon reflex, pryamidal, cutaneo-reflex, spinal automatic, and postural reflex: extrapyramidal. [Camp, Ann Arbor.]

Herman, E. Experimental Study of Chorea. [C. R. Soc. Biologie, Vol. XCII, Oct. 31.]

Experimental study upon rabbits inoculated with cerebrospinal fluid from patients with Sydenham's chorea. The presence of a filtrable virus was claimed to have been discovered. Corresponding anatomic and clinical was claimed to have been discovered which has a marked affinity for organs derived from the ectoderm. Corresponding anatomic and clinical changes are inferred.

De Giacomo, U. Clinical and Experimental Study of Athetosis. [Rivista di patologia nervosa e mentale, Vol. XXIX, p. 791.]

The author describes in detail five clinically observed cases of generalized athetosis, submitting them also to microscopic and experimental study, in order to make clear the inner nature of this unusual syndrome. It was established that the fundamental and constant symptom is present in a special form of hypertonia, the characteristic movements of which are only the more evident clinical expression. The author demonstrates the existence of a pure form of this disorder in which the frequent but not necessary association of other symptoms is absent, such as infantile

spastic paralyses, epileptoid convulsions, profound disturbances of the somatic and psychic development. He attributes to the pure form an exclusively extrapyramidal origin and considers that the association, variable and inconstant, of the other symptoms is due to the extension of the causal morbid process (agenesia, inflammation, etc.), which is operative in intrauterine life or in the first months of extrauterine existence upon the cerebral cortex and the pyramidal myomotor system. The physiopathological mechanism of athetosis would consist in a special ataxia of the pallidum produced by destruction of the corpus striatum or, more rarely, a disturbance of the striate function through lesion of the thalamus, peduncles, etc., *i.e.*, in an alteration of the function which inhibits and regulates the tonus of the antagonists in all the static and kinetic mechanisms of the muscular system. [Author's abstract.]

Nayrac, Paul. Pathogenesis of Hepato-Lenticular Degeneration. [Revue Neurologique, An. 31, T. 2, No. 2, p. 151.]

Report on the histopathologic findings in a case reported clinically in the Revue Neurologique, December, 1923, p. 504. There were severe degenerative changes in the globus pallidus and the nucleus of the tuber cinereum. There were less marked changes in the putamen, the optic thalamus, and the cerebral cortex. There was an intense congestion of the liver with islets of parenchymatous degeneration and beginning fibrosis. [Camp, Ann Arbor.]

Urechia, C. I., and Nitescu, I. Rôle of Tuber Cinereum. [Bull. l'Acad. Méd., Feb. 17, 1925.]

Experimental research on pancreatectomized dogs in which a degenerated periventricular nucleus of the tuber cinereum was found. This finding may confirm the connection of the pancreas with the vegetative centers of the tuber; also the significance of the periventricular nucleus in sugar metabolism, as claimed by Lewy and Dresel and others. A diabetic hypothermia and a pronounced alteration of the periventricular nucleus also found in a case of frostbite suggest that this region may contain important pathways related to the integration of heat production. They use the faulty conception of "centers."

Camus, J., et al. Diabetes from Lesions in Tuber Cinereum. [Presse Méd., Vol. XXXIII, Feb. 25. J. A. M. A.]

Camus, Gournay, and Le Grand induced experimental lesions in the region of the tuber cinereum in rabbits by introducing fine capillary glass tubes filled with a fatty acid. Glycosuria occurred in nine rabbits out of twenty-three, and persisted from one to several weeks. The maximal amount of sugar in the urine was 6.4 gm. per cent. Macroscopic examination showed injury of the tuber cinereum in the nine positive cases, while in the fourteen negative cases the lesion was located elsewhere.

The microscopic findings in eight positive cases demonstrated injury of the paraventricular nucleus in all. In most instances the nucleus of the tuber had also been damaged. Both nuclei proved to be intact in all the negative cases. In one case the pituitary had been completely destroyed by the capillary tube, but diabetes did not appear. Meningitis, compression, or some lesion at the base of the brain may affect the nucleus of the tuber, causing polyuria. A lesion in the walls of the third ventricle, or ependymitis, hemorrhage, or a tumor in the third ventricle may affect the paraventricular nucleus, producing glycosuria.

III. SYMBOLIC NEUROLOGY.

1. PSYCHONEUROSES; PSYCHOLOGY.

Romer, C. Treatment of Psychoneuroses. [Klin. Woch., Vol. 3, 354.]

The first patient was a woman twenty-nine years of age of the asthenic, frail type, with schizoid tendencies. She suffered from an exaggerated timidity and hypersensibility, and had, from childhood been torn between fear and a latent sexuality, the nature of which was entirely unknown to her. She had an abnormal sense of shame during menstruation and was afraid of any contact with men, with the exception of her father, whom she loved. There was a possibility of the Edipus complex in this relationship, although her love for her father may be explained by the fact that the neurotic and frightened girl instinctively turned to a reliable individual for protection against her sexual conflicts. She had violent aversions to foods due to accidental unpleasant associations. Disagreeable experiences of minor importance assumed for her an intense emotional coloring, and became associated with irrelevant acts. She had suffered for years from headache, following an accidental blow on the head. By means of questioning under hypnosis (psychocathartic method), it was possible to elicit many significant childhood and early adult memories, and to explain away the food phobias and other factors of the anxiety neurosis. Following her father's death, the first explosive outburst of grief was followed by a cool composure. This combination of hypersensibility and coolness is characteristic of schizoid individuals. The fear of marriage was finally overcome by further treatment, and the patient later married and became to all appearances adapted in her relations to her surroundings.

Another patient, a woman of twenty-seven years of age, with a nervous constitution, had suffered since her fifteenth year from headache. There appeared to be a connection between this symptom and a jealousy of an older sister whom she considered her intellectual superior. At the age of nineteen years her fiancé was killed. She concealed her grief, repressed her libido, and endeavored to sublimate, by an interest in the troubles of her friends, and by strenuous professional intellectual work. Her close

attachment to her mother was probably a regression to a childhood type of libido. The repression of the normal impulses was further manifested by an abnormal fear of witnessing "ugly" or "immoral" plays. The schizoid tendency was marked. Her physical health was excellent, and she was athletic and active. The hypnotic treatment relieved the headache and neurotic symptoms. A recurrence followed a proposal of marriage which suggested her lost fiancé and aroused the underlying emotional conflict. Hypnosis removed the tension, and restored the confidence and control of the patient, who now appears to be completely recovered.

The third patient, a girl of seventeen years of age, had experienced a psychic trauma (sexual) during childhood. Her mother's severe disapprobation and reproach formed the basis of a sense of guilt which rendered her relations with her companions uncertain. Her gratification in her mother's affection when she was ill led to a subconscious impulse to gain this gratification frequently. Her father and grandfather had a familial tendency to headache, and this symptom therefore suggested itself to her. The physiologic pain accompanying the first menses, for which she was unprepared, and which constituted a shock, became fixed as a psychogenic habit, and was perpetuated as an almost constant abdominal pain, which simulated appendicitis and glandular tuberculosis. The physical structure was dysplastic. Scoliosis and kyphosis were present, and were accompanied by severe and constant backache, which was aggravated by the fear that she might be accused of simulation. Acute articular rheumatism occurred, and was relieved by tonsillectomy. Psychotherapy restored the confidence and equilibrium of the patient to such a degree that she became engaged, and even survived the loss of her betrothed without a recurrence of the symptoms.

A case of urticaria, based upon a psychic factor was relieved equally by suprarenin or by distilled water. A case of pruritus was based upon fear of infection by a servant suffering from venereal disease. Both these cases were completely relieved. In another case, severe bronchial asthma and pulmonary distention were traced to a disappointment in love combined with a moral struggle against masturbation. The patient was of a schizoid asthenic habitus. His mother had died of pulmonary tuberculosis, and this fact would explain the localization and fixation of the symptoms. In another case, the mother of the patient had asthma, and the fear of inheriting the condition led to a psychogenic simulation of the symptoms. Hypnosis led to temporary relief. Analysis of the patient's life, and explanation of the psychologic causes of the symptoms led to their disappearance and to objective improvement in the patient's condition. In the latter case a conflict developed, in the form of a certain hostility toward the physician. This transference of the emotional complex to the physician increased the difficulty of the psychoanalysis.

Psychoanalysis must be carried out with the greatest caution. Sexual complexes must be especially carefully approached. The analyst must frequently combat the hostility and lack of coöperation on the part of the

patient, who is averse to acknowledging the psychic origin of his symptoms, or is rather attached to them as a useful excuse for his shortcomings. In such cases psychoanalysis is difficult, but especially valuable. Symptomatic relief does not constitute cure. The prognosis depends upon the degree to which the patient is able to understand the cause of his symptoms and to adjust himself to realities.

Patini, E. Criminality and Hystero-Epilepsy. [Il Policlinico, Feb. 18, Vol. XXXI, Br. Med. Jl.]

In discussing at some length the question whether the crimino-hystero-epilepsy syndrome of Bratz, the psychasthenic epilepsy of Oppenheim, and the narcolepsy of Gélineaud-Friedmann should not be grouped together under the single term "psycholepsy," as suggested by Morselli, rather than considered as separate nosological entities, E. Patini (Il Policlinico, XXXI, February 18, p. 211) gives in detail the case of a barber aged thirty-four. The family history included alcoholism, syphilis, insanity, and infantile convulsions. The patient suffered from the latter during his first year; he was late in learning to walk. He did fairly well at the elementary school, but his career at the technical college was cut short by imprisonment for wounding a comrade with a stone. After this he gave himself over to a life of vagabondage and petty crime, with occasional intervals of barbering. While on active service with the army for two years his record was good, except for some lack of discipline, until one night he stumbled over the dead body of an Arab, when he passed into a state of stupor, like narcolepsy, until dawn. There followed nervous disturbances, with ten to twelve convulsions at various intervals. These usually occurred when he mounted guard, and occasionally after wine, and culminated in an attack on a non-commissioned officer during what Patini regards as a state of pre-epileptic automatism immediately followed by a fit, on recovery from which he was found to be mentally deranged and kept under restraint. After discharge he was twice imprisoned for theft, once with violence. Various stigmata of degeneration, many cutaneous scars, and symbolical tattoo marks were present, and zones of dulling of tactile, painful, and thermic sensibility, some astereognosis, and lack of precision in joint, muscle, and coördination tests. The visual fields were generally contracted, more so on passing from center to periphery than vice versa; taste, smell, and hearing were diminished. The tongue showed fibrillary tremor and dextro-protrusion, and there was asymmetry of the lower part of the face on the right side. Muscle power was normal, but there was marked fibrillation of the pectorals and tremor of the hands. Romberg's test brought out some temporary swaying; the reflexes were normal. Vasomotor skin reflexes were very easily provoked by emotional or mechanical stimuli (dermographia). The fits were ushered in by a feeling of weakness and by sweating; he became pale and fell without initial cry; he had on occasions injured his head, bitten his tongue, and passed urine and feces involuntarily. After violent general convulsions

lasting twenty to thirty minutes the attack ceased and he regained his senses with a feeling of malaise, general weakness, dazedness, and no recollection of what had happened during or just before the fit. Superficially he appeared psychically normal, but special tests showed poorly sustained, easily distractable attention, deficient intellectual capacity, and a good memory except for the period of and immediately before the fits. Morally he was surprisingly normal, showing affection for his family, inclination for friendship, sensibility to kindness, and no pride in his crimes nor penitence. He did not try to excuse them, but adduced many extenuating circumstances, such as his being orphaned at a tender age and his lack of upbringing; he bore a deep grudge against society, which instead of helping him to reform had sent his to gaol. There was no evidence of malingering. Patini dissects the case and the differential diagnosis minutely. He points out that this case combines some of the characteristics of all the above-mentioned types of epilepsy, a pleomorphic disease in which variations, symptoms, and syndromes may easily multiply without forming a nosological entity. He concludes that cerebral vasomotor disturbance in an individual of such a potentially morbid type may cause impulsive acts and further convulsive disturbances, and that the underlying psychical degeneracy forms the foundation for the three factors which constitute the grand triad of the Bratz type.

Courtney, J. W. Psychoneurotic Backache. [Bost. Med. & Surg. Jl., Dec. 20, Vol. 189.]

Backaches or rachialgias of the nervously adynamic, in Courtney's one-sided opinion, spring not from ideas, but from pathogenic factors of a physical order. These pathogenic factors have a definite place in the category of disease mechanisms in general. The most scientific and logical method of combating the pernicious effects of these factors is through agents which tend to better the physical structure and stabilize the functional activities of the neuroglandular mechanism of organic life.

Stopford, John S. B. A New Conception of the Elements of Sensation. [Brain, Parts III and IV, Vol. 45.]

John S. B. Stopford thinks that no nerve of clinical importance is distributed exclusively to skin. Consequently after section, there is bound to be some disturbance of so-called deep sensibility and it seems quite impracticable to divide sensation into superficial and deep varieties which accompany muscular branches, since the sensory supply of the finger joints undoubtedly arises from the digital nerves. There is also probability that other forms of deep sensibility are in part, at least, transmitted by branches arising independently from the main nerve. The various forms of sensation included under deep sensibility may be dissociated. In recovery reappearance of the recognition of contact and appreciation of pain on excessive pressure occur early, as a rule during the stage of protopathic recovery. Definite improvement in localization and signs of

recognition of passive movement of joints occurs very late and not until there is evidence of epicritic recovery. Deep sensibility ought to be divided like cutaneous sensation, into epicritic and protopathic varieties. The sense of pressure is crude in comparison with appreciation of the direction, localization and range of passive movement in a joint. The former may have thalamic, the latter cortical representation.

Gurewitsch, M. Character Alteration and Organic Brain Diseases. [Zschr. f. d. ges. Neur. u. Psych., Vol. 86.]

Gurewitsch shows that alteration of character may take place in childhood from encephalitis epidemica or other pathological processes. The changes may take a variety of forms which may resemble schizophrenic diseases, constitutional psychopathies, moral insanity especially, and manic-depressive diseases. He cites cases in which the changes followed syphilis or typhus.

Stärcke, A. The Castration Complex. [Int. Jl. Psa., 2, No. 2.]

Defined by the author as the "network of unconscious thoughts and strivings, in the center of which is the idea of having been deprived, or the expectation of becoming deprived of the external (male) genitals." It is a general, possibly a universal complex, but varying greatly in its dynamic potential. Other authors have combined the idea of "punishment for a sexual offense" as a part of the complex, but Stärcke does not believe this is necessary. The castration wishes, and its ambivalent fears he groups under four classes: (1) I am castrated (sexually deprived, slighted), I shall be castrated; (2) I will (wish to) receive a penis; (3) another person is castrated, has to (will) be castrated; (4) another person will receive a penis (has a penis). The first three types he says are manifest as wishes, thoughts or fears. The fourth corresponds to the infantile theory of the "woman with a penis."

The complex is usually traced to a "threat." Freud's "Kleine Hans" affords an interesting analysis and opens up for the author four general problems: (1) "Any" threat is usually in phantasy referred to a "sinful" place. Genital manifestations being frequent the localization of the "sin" becomes evident. (2) Cleanliness of the genitals are early sources of idea linkage; conflict between attendant and child early focuses on this ceremony and transgressions here early lead to fixation. (3) Localized inflammatory disturbances occasionally determine the punishment anxiety, and (4) Actual and universal situations. It is to the latter the paper is limited.

The complex Stärcke holds has a positive side. The penis is put upon the body in places where it does not exist and the first universal identification is the nipple. "The withdrawal of the nipple" as the first "unlust" symbol is here regarded as of importance in the development of the content of the castration thought. He gives several dream fragments indicating the mechanism; one of his own being extensively utilized in

which the oral-eroticism and the castration complex have a common meeting ground: Thus the incest phantasy—my penis disappears in my mother—is another way of saying—my nipple (mother's nipple in my mouth) is again "lost" in the "mamma."

In order to arrange the material the author has recourse to Semon's mnemic hypotheses. The memory of having possessed a nipple like organ, is an early deposit. Stärcke develops two interesting later evolutions out of the oral eroticism as exemplified in the smoker, who wants the "form" and the candy eater, who wishes the gustatory repetition.

Weaning as a necessary activity would make the castration complex universal. The breast feeder and the bottle feeder must have different and important conditionings. The author illustrates the participation of the castration complex in a compulsion neurotic with irregular weaning as an important constituent. Similar situations come out—are ecphoriert —under any loss stimulus and in the depressed manic the castration complex appears in the oral-erotic stage. Thus the whole nursing formulae become of transcendant importance.

The infantile theory of the "woman with a penis" originates from the nursing infant situation. The mother-complex also has an important source in the breast situations. The author also believes that sadism and the breast situation may be intimately related. Thus in certain cases in which nursing is attended with considerable pain to the mother by reason of cracked nipples or other difficulty. The perception of this on the part of the infant is sufficient to overdetermine the sadistic association. Biting of the nipple is another variant; striking the breasts another. By reason of the early predominance of the sucking activity, this oral-erotic domination makes the nipple-penis connotation of transcendent value. As the author puts it, "the nipple, in the form of its later double, the penis, is perceived as the center of one's own personality, and an injury to it is felt as a severe injury to the ego itself. The withdrawal of the nipple is the primitive castration activity."

Chelmonski, A. Physical Needs of the Sick in Hospitals. [Pols. Gaz. Lek., Aug. 6, 1922. J. A. M. A.]

In this article Chelmonski is touching an interesting subject, the importance of the individual care of the sick not only physically but also psychically. To support his view of the importance of this, he cites various physiologic phenomena excited directly by the mind, such as the secretion of saliva and gastric juice from the imagination of savory food. Chelmonski reiterates the necessity for consideration of psychic influences on sick persons, especially in hospitals.

Fleury, Maurice de. Neurasthenia and States of Depression. [La Presse Médicale, Vol. 30, July.]

This author goes back to the dialectic psychology of Dubois, holding that there is nothing more than an artificial dividing line between hysteria,

neurasthenia, melancholia, the anxiety neurosis and certain states of mental degeneration. Neurasthenia is an accidental condition, it suggests toxi-infection and is not constitutional. Its dominant character is fatigue, not imaginary, hypochondriacal fatigue, but a real physical depression, made obvious by loss of tone in the muscles not only of locomotion but of the vegetative system and by a lowering of function in the endocrine system. It is a curable disorder and the most appropriate treatment is to attack the physical side in the first stage and the mental side later. Unlike melancholia onset is slow, so is recovery and there is little tendency to relapse (a very superficial view of psychogenic dynamics).

Freud, Anna. Beating Phantasies and Day Dreams. [Int. Jl. Psa., Vol. IV, Nos. 1, 2.]

Freud's well-known paper on a widespread phantasy—a child is being beaten—is here taken as a foundation for further investigation and exemplification. The following paragraph is chosen as a starting point. "In two of my four female cases an artistic superstructure of day-dreams, which was of great significance for the life of the person concerned, had grown up over the masochistic phantasy of beating. The function of this superstructure was to make possible the feeling of gratified excitement, even though the onanistic act was abstained from." From a variety of day dreams the present authoress selects one which illustrates this paragraph. This occurred in a girl of fifteen whose abundant phantasy life had not brought her into conflict with reality. Her beating phantasy began at about five years. Its early content was—"A boy is being beaten by a grown-up person"—later, "Many boys are being beaten by many grown-up persons. The objects and the misdeeds were indeterminate. The phantasy was accompanied by excitement and usually terminated in onanism. The usual sense of guilt found present here also, as Freud has shown, indicates an earlier unconscious form of the phantasy, of which the new statement is a modified substitute. In the unconscious form the "beater" is the father, the beaten, the subject herself. Even this form is not primary—the beater is the same, the father, but the beaten one is some one else, a brother or sister, but a *rival* for the father's affection. Thus the phantasy gave to the individual all of the father and turned on the rival his wrath. When the later repression takes place, guilt arises, and the object of the punishment is the child herself. The pregenital anal-sadistic phase makes the beating a symbol of being loved. The third phase has the libidinous excitement, the sense of guilt and the latent content "My father loves only me." In the present case the sense of guilt was chiefly directed against the masturbatory activity. For years the little girl sought to separate the two components and tried to overcome the "habit." Now began a phase of elaboration of the phantasy to prolong the permitted aspects and to delay the tabooed climax. Institutions, schools, reformatories, complicated rules were elaborated. The beaters were usually teachers. Much embroidery of the situations was

constructed with the gradual growth of increasing moral standards the whole phantasy was subjected to greater suppression. Self-reproach, pangs of conscience and a short period of depression followed each "climax," which had begun to be preceded by and followed by a sensation of "pain." At about the age of eight to ten a new type of phantasy arose—"nice stories" she called them. They contained pleasurable elements and kind considerate behavior. The figures now were determinate —they were no longer concealed as in the previous "bad" phantasies. These new phantasies became most strikingly complete and elaborate. The climax of each situation was accompanied by a strong feeling of pleasure, but there was no autoerotic act and no sense of guilt. We now had an artistic superstructure which had grown up over the masochistic phantasies of beating. The patient had no idea of the relationship and separated the "nice" from the "ugly" phantasies very definitely. Whereas all individualities were hidden in the "ugly" phantasies, the analysis of the people of the "nice" phantasies brought out a number of significant details. These she would discuss—she narrated these "continuous" stories with different plots and different figures with gusto. One of these was the prototype as it were. This plot apparently was borrowed along about fourteen from a medieval romance found in a boy's story book. She took up the thread, elaborated it and dealt with it as if it were her own. It was later found impossible to dismember the original from her own creation, which in the main was: A medieval knight has for years been at feud with a number of nobles who have leagued together against him. In course of battle a noble youth of fifteen (the then age of patient) is captured by the knight's henchmen. He is taken to the knight's castle and there kept prisoner some time, until at last he regains his freedom." This is used as an outer framework for her day dream, which may be altered at will in its different integers. Two figures remain fairly constant. The noble youth and the harsh and brutal knight. The two characters are worked out in great detail.

The prisoner's fear and fortitude while undergoing all sorts of violent threats are felt with great excitement and at the climax, when the anger and rage of the torturer are changed into kindness and pity, this excitement resolves itself into a feeling of pleasure. These phantasies might occupy a few days or a few weeks in their coming to the denouement. This knight and prisoner day dream on close inspection was a very monotonous type of affair. Strong and weak: misdeed of the weak which puts him at the mercy of the other—the latter's menace, apprehension—with much prolonged elaboration and final solution by pardon and harmony. This is all there was in all the many elaborate situations in her nice stories and their relation to the beating stories is quite obvious. The solution was altered, reconciliation took the place of beating, otherwise they remained much the same in principle as closer study revealed. Occasionally the two types of stories would be intermingled, the beating scene serving as a vehicle to lead up to the onanism which occasionally

broke through. The function of the "nice" story as a sublimation of its predecessor is made quite clear.

In a third section the evolution of a continued story is traced. The patient finally wrote down a version of the day dream in which the previous repetition of the single events was abandoned to a longer and more elaborate recital of the event, the climax being achieved gradually. Writing the story was held to be a defense to the overindulgence of the day dream, which as a fact did actually fade away. But this is not quite explanatory and the writer concludes that the author gradually acquiesced the point of view of the reader. She began to renounce her private pleasure in favor of the impression she could create in others and she turned from an artistic to a social activity, and thus found her way back from the life of imagination to life in reality.

Tendeloo, N. P. Localization of Consciousness. [Deutsche med. Woch., Vol. 49, Sept. 21.]

Tendeloo says that "a completely uninjured constellation of all the psychic factors is indispensable for clear consciousness." It presupposes a connection between all the psychic centers. A severe disturbance occurs only with extensive lesions.

Book Reviews

Dorsey, George A. Why We Behave Like Human Beings. [Harper and Brothers, New York and London.]

The author of this most delightful book was once a professor of anthropology and a curator of anthropology in the Field Museum of Natural History. The museum habit has been raised to a high degree of service, for here is a veritable "museum of life" with a most amiable, informed, and amusing guide. He opens showcase after showcase, all nicely arranged and in order. He even starts with the nebular hypothesis and traces the whole developmental history of what has been built into man in the course of a billion years. Although the showcases are packed and the labels almost confusing in their profusion—they must be pretty thick for the uninformed reader—yet there is a piquancy in the short descriptions and a whimsicality as one is prodded along the shelves that holds the attention and makes this book what it is, the most attractive and fascinating account of human origins, structures, and behaviors that has appeared in many a year. Here and there an evident distortion appears, but the narrative possibly runs all the smoother for the bit of romance. Then again the author glosses over the surface. This again is in the interest of his readers possibly—for they are mainly nonspecialists. And specialists are usually so stodgy. This superficiality expresses itself in a too strict patterning after certain poster brands of behaviorism in the psychological showcases. We are personally intrigued in his neo-Lamarckian attitude—for we have put it to ourselves for a score or two of years, Where did the evolution come from if not from inner push, environmental variety, and the making of new structures? His cracks at Weissmann are, we believe, all deserved, as if the germ plasm were any holier than any other plasm and not connected with the nerve net. He clears up a lot of bunk about biology, using the word itself, we are glad to see. A trace of sloppy sentimentality shows in the endocrine section; here a bit of romancing dresses up these mystics in bizarre costumes. If the collection had been arranged in a different plan we are disposed to believe we could see cheek by jowl these conceptions along with the Galenic humors and the Egyptians' use of the liver in divination. The endocrines don't crack the whip—the cravings for freedom, for creativeness crack the whip, and the endocrines offer certain early bits of transforming machinery to respond. In the worms the adrenals (chromaffine cells) were all over the place, as Gaskell, Jr., has shown. What neurobiotaxic principles caused aggregates of endocrine cells to form would make a study in extensions of Kapper's work upon certain nerve cell combinations of transcendant

interest. Going through any carefully arranged museum starts a lot of inquiries—this charming book is no exception.

Freud, Sigm. Psychoanalytische Studien an Werken der Dichtung und Kunst. [Internationaler Psychoanalytischer Verlag, Wien, Leipzig, Zurich.]

The modus of those inner constructions which lead to the production of literature or art, such as poetry or as painting or sculpture has always been a matter of curiosity to the outsider, as well as to the producer himself. Practically all poets and painters of distinction have formulated their ideas as to how these promptings have arisen, and the onlookers, technical biographers, or curious savants have spilled oceans of ink in formulating their conceptions as to how it is done.

Correspondence courses can tell us "how to be a 'poet' in twenty weeks," but of such is not the kingdom of Apollo.

Freud has taken some side excursions into the domain of the unconscious relative to this general situation. They have been scattered throughout his writings during nearly twenty years. Hence this volume, which aims to bring these together, unaltered, thus presenting his method of study in a clearer light and giving a better outline to the results obtained.

The general thesis that such activities arise from the unconscious is as old as the hills. This Freud knows perhaps better than anyone else, but he was interested to know where the energy came from and why in this or that individual it created poems, painted pictures, or cut marble images, and what of the particular form taken by these energy carrying vehicles. Why in this case joyous, or sad, and all of the possible variations crowded upon book shelves or hanging upon walls or collected in open or closed spaces?

To correctly appraise these studies they should be read. No review can even do more than mutilate the essence of their subtlety or the measured ease of their presentation. These studies are doubly welcome in this collected volume.

Masson-Oursel, Paul. Comparative Philosophy. With an introduction by F. G. Crookshank. [Harcourt, Brace & Company, New York.]

Dedicated to Lévy Bruhl as his "master" the present work, one of the stimulating volumes issued under Ogden's editorship as the "International Library of Psychology," is unique. The present reader does not pretend to review it. One would have to be a polyhistor, a universal linguist and deeply versed in all of the philosophies of the world to pass judgment upon it.

Some few points arrest our attention. The much despised "reasoning by analogy" is rightfully put into its positive frame in spite of stuffy pseudologicians. It is surprising how much valuable developmental material the author gets out of the many philosophical systems through its use. Even more fascinating are the chapters

upon comparative logic, comparative metaphysics, and comparative psychology.

This is avowedly an introduction only, as the author terms it, an interlocutory examination into the content of the philosophical evolution in the civilizations of Europe, India and China by the use of the comparative method.

The author shows us that the use of analogy such as he has defined it, is neither arbitrary nor fallacious; and that without minimizing the specificity of facts it is permissible to formulate judgments of the following order: "Confucius played in China a rôle comparable with that which Socrates filled in Greek thought; Buddhaghosa rendered to Buddhism the same service that St. Thomas did to Christian faith. Facts which we had supposed belonged only to Europe have been recognized to be endowed with a certain generality; by comparison we are able to sort out that which the different sophisms and scholasticisms have in common from that which is particular to each: our interpretation of these facts, even in so far as concerns Europe, is thereby modified.

On the other hand, this renewal we call the Renaissance stands out as an event proper to our western civilization alone. The comparative method would appear to be valid, since it extends, defines, transforms and revises our knowledge."

Brugsch, Th., and Lewy, F. H. Die Biologie der Person. [Band. I, Lieferung. 2, pp. 323–748, 125 illustrations, 1 table. Urban & Schwarzenberg, Berlin and Vienna.]

In this the second section of Vol. 1 of this important Handbook of a General and Special Study of the Human Constitution, a section of 400 pages, there are but four chapters. Dr. G. Just of Greifswald writes upon Special Human Heredity; Dr. W. Lubosch of Würzburg discusses individual anatomy, separating it from Racial Anatomy and Variation Factors, inquiring into its nature, the nature of twins and developmental factors within the individual. Dr. G. Mittasch of Dresden contributes a stimulating chapter upon Individual Pathology and Disease in General, while the last chapter by Dr. F. Schiff of Berlin takes up the relationships of the Personal Constitution and the capacity or disposition to infection in general and in particular.

Since the overwrought enthusiasms of medicine since the rapid rise of chemical and bacteriological analysis in the past 50 years had swung too far into an exclusive consideration of exogenous or environmental factors in the causation of disease, it is a healthy sign to see this swing back to a knowledge of the balanced relationships of outside and inside factors. For this work, although thus the effort is intent upon the setting forth of inside or constitutional agencies, the program is larger and will include interactionism as the last two chapters indicate.

Here we can only point out the intellectual feast that is being set before us. We hope to give an extended series of comments as the volume comes to a close. Certainly, in recent times, no fuller

table has been offered, and served by special workers well qualified in their respective capacities. Our enthusiasm for this work mounts with each new chapter studied. Here are solid gnostic acquirements with an open outlook towards future possibilities. This is no closed system but a going concern.

Pruette, Lorine. G. Stanley Hall. A Biography of a Mind. [D. Appleton and Company, New York and London.]

Carl Van Doren in his charming introduction says, "Perhaps we Americans, with our republican partiality for simple characters, are specially in need of the study of more complex types, such as President Hall belonged to. As a nation we are very unfamiliar with them, our history lacks them, our literature lacks them, or has lacked them until lately." There is some truth in this although perhaps we prefer to say that there are plenty of opportunities for Americans to exhibit a greater richness of complex reaction types if we were not hedged about with so much puritanical prudery with its resultant hypocrisy. "Simple characters"—this is the bunk. Most of us are afraid and hence conform to a monotonous mode which is called "simple." Those that do explode are often so "bizarre" that perhaps the model of Little Men and Little Women were preferable. Beer in his "Mauve Decade" has pilloried this "simplicity" and this "hypocrisy."

Stanley Hall was one of those men of strength who dared defy the current traditions. The titanic struggle he made with intellectual bossism is a revelation of his character and is enough to make one go Bolshevik at certain tendencies in educational circles.

But of the man himself, his early struggles,—the playboy of western scholarship our author aptly terms him,—no one can fail to love him after reading this delightful portrayal of his activities and insight into his life. Here is a biography that is worthwhile, of a man, who stands out in the history of education of this country as a giant, and a human being.

Dide, Maurice. Introduction a l'Étude de la Psychogenese. [Masson et Cie, Paris.]

Subtitled an Essay upon Psychobiological Evolution one turns to this work with anticipations of pleasure and profit. In the introduction we are told that psychology becomes more and more dependent upon experimental science and clinical methods and opposing schools are merging since they are beginning to draw their materials from the same source. He believes that a psychiatrist can construct a philosophical hypothesis from the material with which he works. Psychology is becoming more and more a neuropsychiatry. Psychological synthesis can no longer be expressed without the aid of the vegetative system, including therein the endocrine activators. The feeling life of mankind incorporates the syntheses of the sympathetic, the medullary, mesencephalic, cerebellar and cortical activities. No real "normal" psychology is possible without the aid of psychiatry.

On last analysis psychology has to go back to energic sources for a complete statement. Hence the author begins his book with a chapter on physicochemical researches. Biological Researches follow upon this foundation. Radiant and convergent energy are the terms the author uses in the upbuilding of his thesis. "Instinct" affinities are a later arriving stage. To the elaboration of this idea a chapter is devoted. There are some interesting generalizations—old, but in a new phraseology, reminiscent of the bipolar energy potpourri of Crile, but simpler and more Heraclitian.

Chapter III deals with the "Elan Psychogenetique"—otherwise inner feelings or affectivity. Here Eppinger and Hess do service and the organic substratum of the emotional life is stressed. Neurovegetative anomalies are brought into the clinical picture as protein shocks, etc., thus epilepsies and other periodic and cyclic phenomena.

This is but a brief glance at this interesting little book of speculations, fruitful and intriguing. There are but 200 pages and we will certainly gain some striking appositions of thought in its reading.

Róheim, Géza. Social Anthropology. A Psychoanalytic Study in Anthropology and a History of Australian Totemism. [Boni and Liveright, New York.]

On the surface of things it might seem that a work of this kind could be left only for those students of the history of mankind whose special field has been termed anthropology. While this may be true for certain anthropological treatises it is not true for this one. It can no more be neglected by the neurologist and psychiatrist than could Frazer's great classic, the Golden Bough. In fact for such it is even more important, for while Frazer's work will remain one of the most enlightening and stimulating works upon the historical development of man's customs and behavior the present work goes beyond the purely historical methods of research and through the labors of an interpretative psychology enters more deeply into the origins of these same customs and social activities. Thus by the comparative method of study of the unconscious of present day mankind as revealed successively from top to bottom in his artistic creations, his day-dreams and those of the night, the dissolutions of psychotic behavior, the history of ceremonial, of custom, the utilization of symbols as magic instruments to carry out his inner cravings, all of this meets in some inner nucleus of biological activity. From this spring of the unconscious flow all of the activities that we speak of as social.

It is to the investigation of these underlying strata of man's evolutionary development that the author turns our rapt attention.

Australia has well been called the home of fossils. A fauna and a flora that is extinct for the rest of the world exist in this isolated region. Just so the earlier rudiments of many of man's customs, now semidissolved in complex considerations in later developing stages of societal behavior, here in Australia the dissociated rudiments exist in pure culture. They thus offer particularly enticing

material for the understanding of later changing forms. Here is an open ontological chapter in the book of human life and Róheim has made it a profitable field for research. Here the intimate relationship between the observances, the ritual of primitive man and our own mental mechanisms are carefully laid bare, whilst the manner in which primitive customs and modes of thought stray into our own civilized life in the form of folk-lore and fairy story are richly portrayed.

No one, as Dr. Eder says in his delightful introduction, "can deny the skill with which Dr. Róheim has presented his vast wealth of material; the patience and persistence with which he has sought to substantiate every statement; no detail is regarded as too trivial or too obscure to escape adequate notice; every statement receives corroboration from all available sources. Every theory advanced is based upon an exhaustive and unprejudiced exposition of the facts, and of all the facts. Dr. Róheim is always careful to point out gaps in our knowledge and weaknesses in the structure that require strengthening or even replacement.

Dr. Róheim brings zeal, a rich store of knowledge, a trained scientific imagination to bear upon the solution of the seemingly baffling problems found in this strange story of man. He follows up every clue with a penetrating insight that, without losing any detail, never gets out of touch with the main issues."

Watson, John B. BEHAVIORISM. [The People's Institute Publishing Company, New York.]

In this series of popular lectures the author reiterates his well known position in relation to psychology. As a protesting student of things scholastic one is reminded a bit of the Soviet cleaning out of the old régime. One wonders whether a surreptitious use of the older ideas under camouflaged names will not be the result. This we believe will occur with the author's rejection of the concept of instinct. Action patterns, types of structure, etc., in what sense these newer terms really differ from the older despised teleologies and entelechies, or the midway tropisms, instincts, etc., all reside in the intelligence of an individual taught that etymologies are after all different from actions and that all definitions are but provisional tools for cutting into the realities of life. Watson gives us no better conceptions to work with after he has dumped overboard the admittedly inadequate definitions—for as F. C. S. Schiller has reminded us that a "true definition must contain all that is knowable of a thing, and who among us can flatter ourselves to know everything about anything." We would have liked to see a better series of portrayals of "instincts" rather than their replacement by the grossly mechanistic theses here portrayed. Even a Watsonian Behaviorist I think will agree with the thesis that it is no armchair deduction to say that seeking mates and food constitute the chief activities of the entire living phylum. It "seems to me," as Mr. Heyward Broun would put it, that to generalize these activities

behind the terms of the instinct of race continuance and the instinct of of self-preservation is as good a form of mental tool with which to summarize and thus intellectually handle the phenomena as any other as yet devised. Only a moron would imagine that by the term "instinct" thus used we are making another anthropomorphic God. Naturally such an atrocious anthropomorphism is no longer needed in psychology, but I suspect it is the Behaviorist who would create such a straw image and through this maneuver bring it into discredit and thus seek to dethrone it from psychology.

The lectures are very discursive, a hodge podge in places, not carefully evolved in others, but always readable and to be judged with one's tongue in one's cheek—a bit.

Helson, Harry. The Psychology of Gestalt. [American Journal of Psychology, Ithaca, N. Y.]

The author, an instructor in psychology in the University of Illinois has contributed to the *American Journal of Psychology* an interesting and thoroughly comprehensive series of critical papers upon the new Configurational or Gestalt Psychology. These are here available in reprint form and offer one of the most succinct and valuable résumés of this movement in contemporary psychology.

Homburger, August. Vorlesungen ueber Psychopathologie des Kindesalters. [Julius Springer, Berlin.]

A whopping big book is the realistic phrasing that comes to consciousness, as one cuts through, later thumbs, and then reads here and there in this 49 lecture, 850-page work devoted to the psychopathology of childhood. Although there pops into the reviewer's mind a remark once made by Cattell at a meeting of the American Psychological Association to the effect that a child playing for five minutes in the sand—the meeting was at some seaside resort—would afford material enough for the work of their association almost for perpetuity. Fortunately this ideal of minute description of childhood's behavior has not obsessed the writer, although the 850-pages make one wonder if it could not have been said less bulkily.

The work opens up with chapters upon development, practice, habit, association, action and mental order. Methodologically the author allies his thoughts here with such thinkers as Husserl, Jaspers, and includes some of the conceptions of the newer configurationists such as Koffka and Koehler. Three lectures develop the themes just mentioned. Then follow eight lectures upon feeblemindedness, including the methods of testing intelligence, one lecture upon etiology, one on Mongolism and Cretinism and two well planned lectures upon the training of the feebleminded. Six chapters now follow upon the feeling life of children and the development of their relations to the environment. This naturally leads up to the child's conflicts, to which two lectures are devoted. The so-called psychopathic character, or constitution is a direct derivation and then the author deals with nervous children, anxious, fearful children, weak

and careless children, those poor in their feeling life, those that are irritable. Then lectures follow upon hysteria, compulsion neuroses, the sensitive child, the only child, infantilism and the psychopathic peculiarities of encephalitis epidemica. Chapter 30 deals with manic-depressive and cyclothymic children, children's lies, pathological lying and phantasy formation, those that run away, tics, enuresis, suicide, criminality—these have special chapters. Freud's conceptions are dealt with in two lectures. Puberty, the epilepsies, five lectures, schizophrenia in childhood and juvenile paresis. This about completes this extremely interesting and genuinely valuable book.

Krutch, Joseph Wood. Edgar Allan Poe. A Study in Genius. [Alfred A. Knopf, New York.]

The Poe tradition still affords enough substance to make new books of which the present is by no means to be neglected.

In the first place it gives an excellent picture of Poe, one that is sympathetic and yet not sentimental nor maudlin; nor in the harsher tones of criticism, not by any means absent, is the author sententious or overbearing.

Finally as to the psychological interest the author has partly entered into the spirit of an understanding of the unconscious processes but touches upon them ever so lightly. Perhaps this is wiser since a true analytic research might be too stodgy and this after all is a work for the lay audience. It is not without interest to the psychiatrist—and to such Poe has always been an alluring figure.

Hillyer, Jane. Reluctantly Told. [The Macmillan Company, New York.]

It so happens that we have been struggling with a huge scientific German tome, "Selbstschilderung der Verwirtheit," by an assistant in the psychiatric clinic of Heidelberg and turn to this work to find much the same kind of material in quite a different form. It is an autobiographical sketch of the sensations, ideas of a woman passing through a psychotic attack. It can be arranged with Maupassant's *H'Ourla*, or James' *Turning of the Screw*, or Stetson's *The Yellow Wall Paper*, in literature. Dr. Collins who writes an introduction compares it with Gerard de Nerval's *Le Réve et la Vie*, and makes some medieval comments about "insanity," an abstraction now relegated to legal usage.

Under quite appropriate subtitles the authoress gives an impression of her mental travail: A Locked Door, The House of Distortion, The Tight Rope and the Ring. Here one can follow the tension, the dissociation, the tenuous hanging on to some semblance of ego function and a final compulsive defense mechanism which would wall up the spiritual abscess and prevent self-destruction. None of this is discussed in the introduction. It might have rendered this spiritual autobiography as illuminating from the scientific side as it is interesting from the human aspect.

Sachs, B., and Hausman, L. Nervous and Mental Disorders from Birth Through Adolescence. [Paul B. Hoeber, New York.]

This work, which the senior author would have it clearly understood, is not a new edition of his older work of similar title but is an entirely new book. It may conveniently be divided for the reviewer's purposes into three sections. An admirable section upon the anatomy of the nervous system. Admirable in its succinct compression but quite unnecessary in view of many excellent works more adequate for the purposes even of such a work. There are about a hundred pages of this. The bulk of the book, for it is bulky, 860 pages, is made up of what the authors call organic diseases of the nervous system, functional and toxic diseases, endocrine disorders and vasomotor and trophoneuroses. This takes us to page 715. The remainder of the book, about 100 pages, deals with mental conditions.

In general our idea about the book is that the opening chapters are adequate—but superfluous—especially since the anatomical foundations or classifications have been almost entirely abandoned in favor of a purely clinical grouping. The second section is orthodox and excellent. The descriptions are clear and definite, at times a little too definite possibly. This gives them pedagogic advantages but hardly indicates the movement of thought and research. To our minds the conception of "diseases" is a trifle scholastic and structural, instead of being moulded upon more functional and dynamic lines. The retention of the older notions of the antithesis of "functional" and "organic" exemplifies this, and the general grouping, admittedly a difficult matter, does not keep the student to a larger unitarian view of the organism as a whole with its modifications of function.

The chapters upon mental conditions are far from satisfying. Here lack of functional thinking gives a dogmatic presentation which is much to be deplored. This dogmatism centers about the scholastic notion of "normal." We read of the "normal child" and "normal youth" and find a marked weaving of autobiography with the presentation of what would better be objective evidence. The chapter is well done and for the most part restrained but the blurb upon psychoanalysis, with which it terminates, is so autobiographical of the senior author that it makes one wonder if he really understands sympathetically any other type of personality than his own. Apart from this smudge we see this work as a very sincere and valuable contribution. Apart from the overemphasis upon gross structural disorders and the underemphasis upon the tenfold more frequent type of behavior problems which confront the physician in touch with infants and adolescents the work is to be highly commended.

Obituary

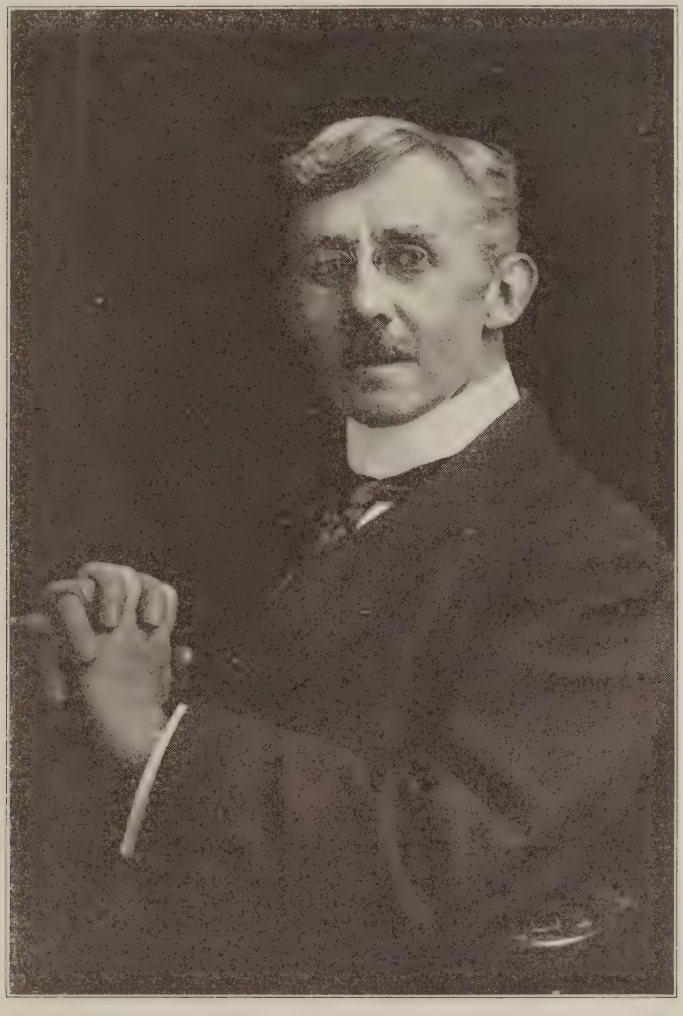
ROBERT HENRY COLE, M.D., F.R.C.P. Lond.

The death of Dr. Cole, which occurred August 10, 1926, removes a much respected authority on mental disease from the ranks of London consulting physicians.

Robert Henry Cole was the eldest son of the late Mr. R. C. Cole of Ealing, and was born in 1866. He was destined for the Civil Service, and for a short time worked as a clerk in the India Office He qualified in medicine, nevertheless, at the age of 23, and after holding a house appointment at St. Mary's Hospital, took up the special study of psychiatry to which the rest of his life was devoted. Thirty-six years of association with Moorcroft House began with his appointment as resident physician soon after leaving St. Mary's, and in the years during which he held this post he won a high reputation for clinical skill and for the helpful care which he bestowed on his patients. He always made remarkably good use of his time; he read a great deal and he was keenly interested in his specialty. In 1907 he began to engage exclusively in consulting practice, and soon afterwards was appointed physician for mental diseases to St. Mary's Hospital and lecturer in the medical school. He later became an examiner in mental diseases and psychology in the University of London, and held several other appointments, including those of Home Office Visitor to the State Inebriate Reformatory at Aylesbury, visitor to the approved institutions for the mentally defective in Middlesex, and lecturer in mental diseases at Bethlehem Royal Hospital. His considerable experience is embodied in the well-known textbook on mental diseases which he wrote—now in its third edition—whilst his knowledge of, and sympathy with, modern views on psychology and treatment were shown in his presidential address to the Section of Psychiatry of the Royal Society of Medicine recently published in our columns. This thoughtful comment on the progress of the last thirty or forty years is evidence of a wide outlook, and is written in his characteristic style.

For the Royal Medico-Psychological Association Dr. Cole did a great deal of painstaking work. At the time of his death he was

chairman of the Parliamentary Committee of the Association, in which office his acquaintance with the legal relations of insanity were very valuable. Intimate knowledge of the history of lunacy legislation enabled him to offer wise counsel, and the Association owes



Robert Henry Cole, M.D., F.R.C.P.

a great deal to him. "His place," writes one of his colleagues, "will be hard to fill. Those who knew him will miss his genial and kindly presence. Unchanging loyalty was the most striking feature of his friendship. He always gave unsparingly of his best, and was ac-

customed to take immense pains with his patients, on whose behalf he labored without counting the cost in time and trouble. And his younger colleagues would seek his advice constantly, knowing that he would appreciate their problems and help them in every possible way."

Dr. Cole leaves a widow, a son, and a daughter. [L. Lancet.]

Professor Leonardo Bianchi of Naples died February 13, 1927. Also Professor d'Abundo who succeeded the chair of Professor Bianchi. Obituary notices will appear in a later issue of the JOURNAL.

N. B.—All business communications should be made to Journal of Nervous and Mental Disease, 64 West 56th St., New York.

All editorial communications should be made to Dr. Smith Ely Jelliffe, Managing Editor, 64 West 56th St., New York.

Vol. 65 MAY No. 5

The Journal

OF

Nervous and Mental Disease

An American Journal of Neuropsychiatry, Founded in 1874

Original Articles

REFLEXES IN APES

By G. D. Aronovitch, M.D.

NEUROLOGIST AT THE METCHNIKOW HOSPITAL, LENINGRAD, RUSSIA

The biogenetic trend in neuropathology has led us to consider the data of comparative anatomy and physiology. The evidence obtained in this field enables one to explain a series of clinical facts from the evolutional viewpoint and thus makes it possible to trace the phylogenetic development of some of the reflexes in man. We believe that many of the symptoms found in nervous syndromes are none other but manifestations of evolutional regression, that is of a lowering of the nervous system to a lower level of functioning. Thus, for instance, the symptomatology of lesion of the central motor neuron or the so-called "pyramidal" symptoms characterize just this lowered stage in the functional development of the central nervous system, when there appear a series of reactions peculiar to a lower animal organism.

In order to determine the biological nature of both normal and pathological manifestations of the nervous system in man comparative physiological data are indispensable. My present work is a result of this attempt and in it I selected as material for my neurological investigations apes, since they stand nearest to man in the evolutional scale of the animal world. I do not expect my investigations to be considered as final. We have accumulated but the facts which were of neurological interest to us from the clinical viewpoint.

I started my investigations on apes in our Zoölogical Gardens in Leningrad (3 *Maccacus rhesus,* 1 mongoby and 1 female orang-outang of four years old), and then proceeded with the most important part of my work in the "Affenhouse" of the Hagenbeck Zoölogical Park in Hamburg. The total number of apes subjected to investigation was 23 (14 *Maccacus rhesus,* 2 baboons, *Cino-*

pithecini, 4 mongoby, 1 orang-outang, 2 lemurs, *Cati*), their age varying between two to four years. The methods applied to the apes were those methods of neurological examination accepted in the clinic. Here I once more wish to emphasize that this work is nothing but an experiment in comparative neurology.

Now let us give our attention to the cranial nerves and their reflexes in apes.

Pupillary reaction to light, direct and indirect: A stimulation of the pupils by means of any source of light (personally I used for the purpose an electric pocket lantern) always produces a reflex contraction of the pupil in apes. This direct reaction is always accompanied by an indirect one, that is by a simultaneous contraction of the other pupil.

Pupillary reaction to convergence: This reaction may be observed in apes when one has succeeded in fixing its gaze by showing it at a distance some shining object, say a percussion hammer, and by rapidly approaching this object to the ape's nose. Then a distinct contraction of both pupils is observed with a simultaneous convergency of both ocular axes towards the middle line.

We succeeded to produce in the apes (subjected to our investigations) the following mucous reflexes.

The corneal reflex: A slight touch on the cornea by means of a piece of paper or cotton produces a reflex closing of the eyelids. A similar motor reaction that is a rapid closing of the eye is produced in apes by touching the conjunctiva of the sclera with a piece of paper. This is the so-called *conjunctival reflex. The nasal reflex,* which is produced by a mechanical irritation of the mucosa of the nose with a piece of twisted paper or a feather and manifests itself in a puckering of the nose and motions similar to sneezing also belongs to the group of mucous reflexes. Further I succeeded in observing in apes a reflex caused by an irritation of the external ear passage. By irritating the walls of the external ear passage with a piece of paper, a match or a feather—a contraction of the face muscles is produced—a closing of the eyelids, a motion of the cheeks and even a drawing away of the head. This protective reflex is very brisk and constant in apes.

I also verified McCarthy's *supraorbital reflex,* Bechterew's *Augenreflex* and the nasopalpebral reflex (Guillain) as being among the periosteal facial reflexes present in apes. The *supraorbital reflex* is always produced in apes by a percussion in the regio supraorbitalis but outside the region of m. orbicularis orbitæ. The percussion not only results in the contraction of this muscle on the side stimulated,

but also produces a cross-wise muscular reaction, *i.e.,* a contraction of M. orbicularis oculi on the other side and is followed by a slight closing of both eyes. The *nasopalpebral reflex,* which in its periosteal nature, its reflexogenic zone and in its motor effect is identical with the supraorbital reflex is of the same constancy in apes. *The naso-palpebral reflex* is produced in apes by a percussion with a hammer on the nose at its base. This produces a reflex reaction which manifests itself in a rapid closing of the eyelids, *i.e.,* a symmetrical and bilateral contraction of m. orbicularis orbitæ. From the anatomo-topographical point of view these muscles in no way differ from the same muscles in man. Thus for instance this reflex is one of the motor components of a more generalized periosteal reflex as Simchowicz's Nasenaugenreflex or Astwazaturow's nasolabial reflex.

While obtaining these reflexes in order to avoid any protective reflex movements of the animal, which also manifest themselves in a closing of the eyelids when some object is rapidly and suddenly approaching toward its eyes—réflexe de défense, opticofacial or opticopalpebral reflex, Bedrohungs reflex,—I usually asked my assistant to cover the animal's eyes with his hand at a right angle towards its forehead and besides I gave it a light hit with the percutory hammer from above, on the side of the forehead.

The study, or more correctly speaking, the verification of the abdominal reflexes in apes was of particular clinical interest to us. I applied for this purpose the usual technique, consisting of stroking the skin of the abdominal wall, which corresponded to the upper, middle and lower abdominal reflex areas. During the experiment the animal was either laid flat on its back with bent hind (lower) extremities or was seated in a semi-reclining posture, being supported by my assistant. Thus a complete relaxation of the belly muscles was attained. In none of the examined apes could I produce the abdominal reflex, *i.e.,* a contraction of the belly muscles in reply to a skin irritation such as are observed in man. Nevertheless the morphological structure of the abdominal wall muscles does not differ materially from the same structure in man. We find in apes the m.m. recti abdomin., obliquus, extern., intern., transversalis abdomin, with analogical fixations and functions. Besides these surface abdominal reflexes (or skin reflexes) other deep abdominal reflexes have been lately noted in man. These are—the periosteal reflex or réflexe médio-pubien (Guillain, 3) and the tendo-abdominal reflexes (Astwazaturow, 4; Triumphow, 5). Both these reflexes are almost identical and have been suggested by the different authors quite independently from one another and almost simultaneously. *Reflexe*

médio-pubien or the periosteal reflex results from a percussion on symphysis pubis and causes contraction of the abdominal wall muscles and an adduction of both thighs in man. According to Guillain this reflex consists of two effective parts: the upper and the lower. The first consists in the contraction of the belly wall muscles (m.m. recti abdom. and obliq.) the second in a symmetrical contraction of the adductor muscles (m.m. adductores, pectinei) of both thighs caused by a percussion on the symphysis ossis pubis. In apes a percussion of the symphysis pubis produces only a reflex motor reaction on the part of the hind extremities—*an adduction of the thighs, but the abdominal muscles do not contract.* Thus in apes the réflexe médio-pubien consists only in its lower component, that is the motor reaction produced by a percussion on the symphysis pubis manifests itself only in an adduction of both thighs which are also somewhat rotated inward, whereas the upper component of this compound reflex—the contraction of the belly wall muscles—is absent. In order to excite the réflexe médio-pubien it is best to place the ape lying on its back or in a semi-reclining posture, with the hind extremities slightly bent in the hip and knee joints with a slight rotation outwards, the assistant holding the animal by the upper (front) extremities. Then the reflex may be observed most distinctly and one is able to see the contraction of m.m. pectinei, adductores. As regards the *tendo-abdominal reflex* (Astwazaturow, Triumphov) which is identical with the réflexe médio-pubien it is elicited by a percussion on the tendons of the abdominal muscles in the region of lig. Pouparti and Tuberculum pubicum and consists in man of a contraction of the abdominal muscles (chiefly m. rectus abdomin. and the oblique muscles) on the side of the body subjected to the stimulus. This deep tendo-abdominal reflex (Astwazaturow) cannot be obtained in apes. My repeated and numerous observations enable me to affirm that the abdominal reflexes—both the superficial skin reflexes and the deep periosteal and tendinous reflexes—are absent in apes of breeds which were subjected to my investigations.

This fact seems to us to be of great interest from the evolutional viewpoint and may serve to confirm the correctness of our point of view with regard to the nature of the abdominal reflexes in man, which is described in detail in Professor Astwazaturow's,(6) Aronovitch's (7) and Triumphov's articles. The phylogenetic data obtained—leaving aside the ontogenetic data—also makes us believe that the appearance of the abdominal reflexes in man stands in relation to the acquisition by the human body of the erect posture, with its forming the action of standing and walking on two legs. A mighty

reflex mechanism for the abdominal muscles which is capable of prompt excitation is certainly quite indispensable for these acts as the abdomen lacks a bony support in front. It is interesting to note in passing that when our orang-outang attempted to move about in a vertical posture on its hind extremities and holding on to the bars of his cage with outstretched upper extremities our attention was drawn to the fact that its abdomen was distinctly propendant.

The abdominal reflexes (both the deep and the superficial ones) in man are a manifestation of that particular tone of the abdominal muscles which had formed during the process of evolution when the human organism acquired and finally fixed its erect posture, whereas apes, even the anthropoids, are not yet orthograde creatures and as is well known chiefly move about as quadramanus animals. Thus it follows that the abdominal reflexes are phylogenetically new reflexes.

In many of the apes I succeeded to produce the so-called *Bechterew's costal reflex* (9) which is supposed to be a bone reflex and which is caused by tapping with a hammer or passing the handle of the hammer along the cartilages of the lower costal arches roughly. The reflex manifests itself in a contraction of the muscles in the region of the epigastrii together with a contraction of the intracostal muscles. This contraction of the intracostal muscles and the notches of the oblique abdominal muscles, reminding one of the keys of a piano, when caused by passing with the handle of a percussion hammer along the costal arches are particularly pronounced and distinct in lean apes in a condition of inanition. Repeated tests do not produce a weakening of this contraction which does not seem to become gradually exhausted as is usually the case with a reflex action. Personally I am inclined to consider this phenomenon as a condition of increased mechanical muscular excitation but not a reflex.

In male apes subjected to my investigations (*Maccacus rhesus,* mongoby—the other being females) the skin folds on the anterior abdominal wall in the inguinal region formed a kind of pocket, containing small testes of the size of a pea or a coffee-bean. The scrotum was not fully developed and possessed no muscular fibers (m. cremaster). Therefore we were not able to produce the cremaster and scrotum reflexes which may be attributed to an insufficient morphological development of the scrotum in these apes. Unfortunately I had not the opportunity to examine representatives of the higher Simiidae which are said to possess a fully developed scrotum (Sonntag, 8).

Deep reflexes—the tendinous and periosteal reflexes—of the hind (lower) extremities are very constant in apes.

The knee reflex. A percussion on the lig, patellae at the lower edge of the patellae produces in apes a contraction of m. quadriceps femoris and consequently a pronounced extension of the lower extremity in the knee-joint. In order to obtain this reflex my assistant seated the ape on his lap with its hind extremities drooping downwards, or the animal was placed in a semi-reclining posture with the extremities bent in the knees and somewhat abducted. In these conditions, if the ape's attention is directed elsewhere, a hit with the percussion hammer on the lig. patellae always produces a vivid knee-reflex—a straightening of the corresponding extremity. In some apes a similar test produced simultaneously a *crossed knee-jerk.* We also succeeded in producing in apes subjected to our investigations in a similar posture a crossed *knee-adductor reflex*—a reflexive contraction of the adductor muscles of the thigh (m.m. pectin. adductores(by an irritation (percussion on lig. patellae) of the opposite side of the body, that is by eliciting the usual knee-reflex.

It is not difficult to produce in an ape the *Achilles reflex.* The ape is placed lying on its back with the extremities bent in the knee joint. The foot is subjected to a slight passive dorsal flexion and is sustained in this position with the hand. A hit with the percutory hammer on the tendon of m.m. gastrocnemii thus causes a contraction of the gastrocnemius muscles and a plantar flexion of the foot. In apes a mechanical irritation of the skin of the sole produces a typical seizing action of the foot (extension and opposition of the hallux with a subsequent flexion of the hallux and the other four toes and a rotation of the entire foot medially)—but we do not observe in apes the usual plantar reflex normal in man and consisting in a simultaneous flexion of all five toes. In apes the functional activity of the foot differs but little from the functional ability of the hand. It possesses the seizing function in an equal degree and therefore an ape easily clasps any object (for instance a tree) with its foot by abducting, extending and opposing the hallux to the toes in just the same way as it does with the front (upper) extremity. The human foot almost entirely lacks the seizing function. Owing to the anatomical peculiarities in the structure of the human foot it performs this function only in a rudimentary manner and this only in early childhood or in pathological cases of lesions of the pyramidal tract. Babinski's symptom which is observed in such cases in reply to a skin irritation of the foot is a rudiment of this seizing function of the human foot.

Here the action of the hallux is limited as it produces only the initial motion (dorsal extension) not being capable of performing the essential movement of the seizing action (opposition of the hallux) owing to the absence of a corresponding muscle (m. opponens).

I shall not deny that my neurological investigations of apes were accompanied by many difficulties owing to their peculiarities. The apes which are excitable and irritable in most cases resisted our investigations either by always being in motion or by spontaneously checking the reflex movement. It needed much time and patience in order to test this or the other reflex having profited by the moment when the ape's attention was directed elsewhere by my assistant. These difficulties were particularly pronounced during the examination of the upper extremities as my assistant usually held the ape by its front extremities having placed them behind its back. It was often rather difficult to decide whether the flexion of the forearm (reflex of m. biceps) was a result of an irritation of the tendon of m. biceps or the result of a mechanical irritation of the flexors of the forearm owing to the insufficient development in apes of the tendon lacertus fibrosus (Sonntag).

I did not succeed in causing the carporadial reflex in apes and a percussion on the distal section of the radial bone did not produce any reflex effect.

With regard to the above described reflexes it must be added that the degree of their manifestation or in other words their intensity varied fairly considerably. In some of the excitable and fearful apes (maccacus rhesus, mongoby) who according to the evidence of the personnel showed signs of nervousness, we actually observed a general increase in the reflex excitation. An examination, a touch with the percussion hammer or a feather were enough to cause a general shuddering of the animal and besides the reflexes were also noticeably increased—as for instance the corneal, the nasal, the naso-palpebral or the knee-reflex, whereas in other specimens the reflexes showed no particular deviation and were of equal intensity.

REFERENCES

1. Guillain, George. Le réflexe naso-palpébral. Comptes réndus des séances de la Société de Biologie, 1920, p. 1394.
2. Simchowicz. Nasenaugenreflex—Deutsche Zeitschr. v. Nervenheilkunde, 1922.
3. Guillain. Le réflexe médio-pubien, Études Neurologiques, 1925.
4. Astwazaturow. Eine biologische Deutung des Verhaltens der Reflexe bei Pyramidenbahnerkrankung—Zeitschr. f. d. ges. Neurologie u. Psych., 1926.

5. Triumphow. On the tendo-abdominal reflex (Russian) Report in the Society of neuropathologists. Leningrad, 1925, Februar.
6. Astwazaturow, U. On the Nature of Abdominal reflexes. The Journal of Nervous and Mental Disease. June, 1925.
7. Aronovitch, G. On the Nature of Cremasteric Reflex. Ibidem, 1926.
8. Sonntag, Charles. The Morphology and Evolution of the Ape. London, 1924.
9. Bechterew. Nervous Diseases. Petrograd, 1915 (Russian).

ENDOCRIN AND BIOCHEMICAL STUDIES IN SCHIZOPHRENIA

By Karl M. Bowman, M.D.

ASSISTANT PROFESSOR IN PSYCHIATRY, HARVARD MEDICAL SCHOOL; CHIEF MEDICAL OFFICER OF THE BOSTON PSYCHOPATHIC HOSPITAL, BOSTON, MASSACHUSETTS

The following studies were undertaken in an endeavor to see whether a number of special tests would yield any useful information concerning the nature of the schizophrenic process. In view of the fact that Kraepelin (1) has emphasized the possible endocrin origin of dementia praecox it seemed advisable to study a series of cases using tests which would, in general, have some relationship to the activity of the endocrin glands. Twenty-four cases of schizophrenia, 18 females and 6 males, were studied with this purpose in mind. The following studies were made:

X-ray Studies

These studies were made to learn if any abnormal findings would be revealed which might throw any light on the nature of the schizophrenic process. X-rays of the skull were taken to show particularly the sella turcica and the sinuses. X-rays of the teeth were taken. An X-ray was made of the terminal phalanges, partly to note if there was any evidence of tufting. X-rays of the chest were made in order to determine the size and shape of the heart, the condition of the lungs and whether or not there was a thymus shadow. An X-ray of the gall bladder was made. An X-ray series of the gastro-intestinal tract was made, using the usual barium meal. All X-rays were taken by the X-ray technician, Mr. William Pollino, and the interpretations were all made by the hospital roentgenologist, Dr. Whitman K. Coffin.

Basal Metabolism

A basal metabolism was done, using the Roth-Benedict outfit and the standard technique. The standards for body surface as determined by DuBois (2) were used. In some cases repeated studies were made but in many cases the lack of coöperation of the patient

* Read before the Association for Research in Nervous and Mental Disease, December 27, 1925.

prevented a completely satisfactory determination. It would seem that in some cases our findings are undoubtedly too high and that further tests with complete coöperation would have given lower readings.

Blood Sugar Curve

The blood sugar curve was calculated, using the standard method prescribed by Janney.(3) The sugar determinations were made, using the method of Folin and Wu.

Galactose Tolerance Test

The galactose tolerance test was done, following the technique prescribed by Rowe.(4) (Forty grams of galactose were fed to women and thirty grams to men.)

Blood Chemistry

A study of the blood chemistry was made. Examinations for the non-protein nitrogen, urea, creatinin, amino acid nitrogen and sugar were made, following the method prescribed in Folin's Manual of Biological Chemistry. The uric acid was determined by Benedict's (5) method, using a tungstic acid filtrate. The calcium determination was done according to the method of Kramer and Tisdall.(6) The phosphorus was done by the method of Bell and Doisy (7) and the chlorides were done by the method of Austin and Van Slyke.(8)

Blood Count

A complete blood count was done, using the standard technique. One hundred cells were counted for the differential. The hemoglobin was determined by either the Tallquist or Sahli method as shown by the letter T or the letter S in the findings.

Kottman Test

The Kottman (9) test was performed under the following technique which is given in detail since most writers on the subject are extremely vague with regard to the exact details and methods used.

(1) Fasting blood obtained at 9 A.M. and poured into a centrifuge tube; (2) Then tubes with the blood immediately transferred to an ice box, corked and allowed to stand there for five hours and then centrifuged; (3) 1 c.c. of the clear serum (with no hemolyzed blood) transferred into a standard Wassermann tube (1.20 cm. & 8.5 cm.);

(4) 0.25 c.c. of 0.5 per cent solution of potassium iodid added and the iodid allowed to diffuse through the serum by gentle agitation of the tube, for 60 sec.; (5) 0.3 c.c. of a 0.5 per cent solution of silver nitrate added to the tube gently agitated, for 60 sec. (6) After satisfactory mixture had been obtained the test tubes were exposed to a 500 watt lamp for five minutes at a distance of 25 cm.; (7) following exposure 0.5 c.c. of 25 per cent sol. of hydroquinone was added; (8) color change noted at 2½, 5, 7½, 10, 20, and 30 minutes.

The following precautions were taken to insure a standard and uniform technique.

The patient received no iodides or bromides for at least a week before that test. The breakfast was omitted on the day of the test so that at least 12 hours expired before the blood was drawn.

The serum must be absolutely clear with no traces of hemolysis or else the delicate color changes are easily obscured. The serum must not be in contact with air more than six hours because oxidation of the serum accelerates the test. Before the completion of the test, the serum must be in an ice box because temperature changes alter the velocity of the reactions.

In order to eliminate the individual variations the same individual reads the color changes. The following terms are for the various color changes.

Light color change; light brown, brown, deep brown.

The solutions are freshly prepared and kept in dark bottles.

Spinal Fluid

The spinal fluid was examined as follows: All examinations were made in the morning after the patient had been fasting for at least twelve hours. A fasting blood was taken at the same time in order that the blood sugar might be compared with the spinal fluid sugar. In Case No. 7 the patient was fed sugar for a blood sugar curve shortly before the lumbar puncture was made. The spinal fluid sugar was determined, using the Folin-Wu method as described in Folin's Laboratory Manual, 1922. The spinal fluid was diluted with water 1–10 and the remaining technique was the same as that for blood sugar. The total protein was determined by the method of Denis and Ayer. (10) Pandy's method was used in testing the globulin. The cell count was made using a Fuchs-Rosenthal counting chamber, and an ordinary pipette for white blood cell counts. Polychrome methylene blue is drawn to 0.5, then spinal fluid to 11. The colloidal gold test was made according to the usual standard conditions. The Wassermann test was made at the Massachusetts State Wassermann

Laboratory at the Harvard Medical School. It may be stated here that the blood Wassermann was negative in every case.

Gastric Analysis

The gastric analysis was done under the usual standard conditions. The fasting contents were obtained and after the feeding of an Ewald test meal the Rehfuss tube was allowed to remain for one hour at which time the gastric contents were again examined. The microscopic study of the fasting contents was made and both the fasting and one-hour contents were examined for free hydrochloric acid, total acidity and for blood by the benzidene test.

Renal Function

The renal function test was done under the standard conditions of injecting 1 c.c. of phenolsulphonephthalein and examining the urine secreted for 2 hours 10 minutes following the injection.

Oculocardiac reflex

The technique employed in this series was to have the patient flat on his back on the table. After he had arranged himself comfortably the radial pulse was counted for one minute. The blood pressure was then taken with a Baum-anometer apparatus and the pulse was counted through this minute to determine whether the taking of the blood pressure influenced the rate. In the appended tables these two minutes are designated as 1 and 2. During the next two minutes pressure was made on the eyeballs of the patient with the thumbs. The endeavor is made to make this pressure just short of the pain threshold. The pulse is counted during these two minutes and through consecutive following minutes until it returns to the rate of the first minute. The blood pressure readings are resumed at the time the pressure is released and consecutive readings are made until the pressure returns to level of first reading if possible.

X-ray Studies

Case 1: X-rays of the skull were entirely negative. The sella was of normal size and shape with no evidence of erosion. The sinuses were clear and showed no evidence of infection. The terminal phalanges and hands were negative and there was no evidence of tufting.

Case 2: X-rays of the skull showed that the sella was small and nearly bridged. The sinuses were clear. X-rays of the teeth showed that there was pericementitis of the upper left second molar. There was

a large area of decalcification involving all the lower incisors due presumably to infection and atrophic changes in the bone. The terminal phalanges were negative. The heart was long and narrow, markedly ptotic type. The lungs showed numerous partly calcified glands with peribronchial thickening but no evidence of parenchymal involvement. The findings were consistent with healed or inactive tuberculosis. The thymus was not enlarged. Gall bladder was negative. The gastro-intestinal study was negative except for ptosis and moderate stasis in the caecum and ascending colon 24 hours.

Case 3: X-rays of the skull showed that the sella was small and nearly bridged. The frontal sinuses were absent but rather large supra-orbital ethmoidal cells were present covering a considerable area, but being very shallow. X-rays of the teeth showed an apical abscess of the lower right first molar, and pericementitis of the lower left second bicuspid. All the last molars were unerupted. The terminal phalanges were negative except for a slight tendency to small size and round, smooth ends. The heart and lungs were negative and the thymus was not enlarged. The gall bladder was negative. The first gastro-intestinal series showed that the stomach was in normal position, that the duodenal cap did not fill properly, probably due to nervousness and dislike of buttermilk with resulting duodenal spasm. There was a possibility of intrinsic duodenal lesion (ulcer). There was no definite filling defect noted in a very poorly filling cap. There was no six hour residue and the barium was in the ascending colon and hepatic flexure. At the end of 24 hours there was no barium in the bowels. A second gastro-intestinal series was entirely negative.

Case 4: X-rays of the skull showed two areas of bone thinning in the right frontal region high up (probably parasinoidal sinus) connected by enlarged vessels with a similar area over the right orbit, probably due to old trauma or inflammatory or neoplastic disease with resulting engorgement of vessels. A second X-ray revealed similar findings. The sella was negative. The sinuses were clear. X-rays of the teeth showed that there was a probable old healed apical abscess of the upper right second bicuspid. The upper third molars were absent. The terminal phalanges were negative. The heart and lungs were negative. The thymus was not enlarged. There was a possible subdeltoid bursitis present on the right side and a small calcified mass three inches below the head of the humerus on the right side was present. The gastro-intestinal series showed no evidence of abnormality except a small, irregular, poorly filling duodenal cap which in certain positions showed probable evidence of gall bladder pressure. The films of the gall bladder, however, showed nothing abnormal.

Case 5: X-rays of the skull showed a rather large sella which was nearly bridged. The sinuses were negative. Teeth showed apical abscess of the upper right lateral incisor. The terminal phalanges showed a slight tendency to tufting which was not at all marked. The heart and lungs were negative. The thymus was not enlarged. The gall bladder was negative. The gastro-intestinal series was negative.

Case 6: X-rays of the skull showed that the sella and sinuses were negative. The teeth showed no evidences of infection. The terminal phalanges were negative. The heart and lungs were negative and the thymus was not enlarged. The gall bladder showed a very doubtful shadow present but reëxamination was entirely negative. The gastro-intestinal series was essentially negative but showed slight colonic stasis. There was slight ptosis of the colon. At the end of 24 hours the bulk of the barium was in the hepatic flexure and ascending colon and sigmoid.

Case 7: X-rays of skull showed a normal sella and sinuses. There were no teeth present. The terminal phalanges were negative. The heart was long and narrow and the lungs were negative and the thymus was not enlarged. The gall bladder was negative. The gastro-intestinal series showed a long, dropped stomach with a small six hour residue. There were no filling defects. The duodenum was negative. There was a moderate amount of barium meal in the ascending colon at the end of 24 hours but there was not much stasis.

Case 8: X-rays of the skull showed that the sella was rather large but not eroded. The sinuses were clear. The teeth were negative. The terminal phalanges showed a question of slight tufting. The heart and lungs were negative and the thymus was not enlarged. The gall bladder was negative. The gastro-intestinal series showed that the stomach was atonic and that there was slight ptosis. There was a small six hour residue. There was a moderate 24 hour colonic stasis in the ascending colon.

Case 9: X-rays of the skull showed that the sella and sinuses were negative. The teeth showed an apical infection of the upper right first bicuspid, an apical pericementitis of the upper left cuspid, a pocket between the lower left second bicuspid and molars. The lower third molars were absent. The terminal phalanges were negative. The heart was negative but the pulmonary artery was prominent. The lungs were negative except for a moderate generalized peribronchial thickening which was not considered tuberculous. The thymus was not enlarged. The gall bladder was negative. The gastro-intestinal series showed that there was a concavity of the antrum of the stomach, possibly due to a gas distension of the hepatic flexure. No other filling defects were

noted. Peristalsis was very inactive. The duodenal cap filled poorly and showed spasms. There was a fairly large six hour gastric residue, presumably due to the inactive peristalsis and the spastic duodenal cap. There was a moderate 24-hour stasis. No ptosis was present. No definite organic lesion was noted.

Case 10: X-rays of the skull showed that the sella was normal. There was slight crowding of the right ethmoid. There were several rather large Pacchionian depressions. The teeth were negative. The terminal phalanges were negative. There was a "drop heart." The lungs showed a questionable bronchiectatic focus in the right base. There was moderate peribronchial thickening. The thymus was not enlarged. The gall bladder was negative. The gastro-intestinal series showed that the stomach was rather dilated, somewhat atonic and ptosed. There was no six-hour residue and no filling defect. Small bowel was negative. The colon was ptosed and there was moderate 24-hour residue.

Case 11: X-rays of the skull showed normal sella and sinuses. The teeth were negative. There was some recession between the left first molar and bicuspid. The terminal phalanges were negative. The heart was somewhat narrow and long. The lungs showed very slight increase of linear markings in both upper lobes, particularly the right, possibly due to very early tuberculosis but not at all definite. The thymus was not enlarged. The gall bladder was negative. The gastro-intestinal series showed that the stomach was slightly atonic. There were no filling defects or six-hour residue. Occasional pressure defect of the antrum was noted. Small bowel was negative. There was slight colonic ptosis and considerable colonic and sigmoidal 24-hour residue.

Case 12: X-rays of the skull showed sella of normal size with no erosion. The right antrum was densely clouded due to pus or a much thickened membrane. X-rays of the teeth showed foreign bodies in the upper right second bicuspid region plus a minute root fragment. Foreign bodies in the upper right incisor area. The heart and lungs were negative. The thymus was not enlarged. X-ray of the abdomen showed numerous metallic objects in the gastro-intestinal tract such as nails, screws, etc., and a hot water bottle stopper in the rectum (the patient had put foreign bodies into his mouth and rectum). A barium series could not be taken.

Case 13: X-rays of the skull showed the sella and sinuses to be normal. There was a definite thickening of the tables of the frontal bone extending to the region of the coronal suture from a point 1¼ inches above the floor of the anterior fossa, probably a very slight exostosis. An X-ray of the teeth showed an impacted lower right third molar, an impacted rudimentary upper right central incisor, recession of both the right and left upper second and third molars. The terminal phalanges showed erosion of the third right terminal phalanx (traumatic). The heart and lungs were normal and the thymus was not enlarged.

The gastro-intestinal series showed a pressure defect of the duodenal cap and the antrum, probably due to kidney but possibly to gall bladder pressure. Stomach was otherwise negative. There was no stasis. There was considerable ascending and transverse colon stasis at 24 hours.

Case 14: X-rays of the skull showed the sella and sinuses to be normal. Teeth showed apical abscesses of the upper left lateral incisor, lower left second bicuspid and the upper right first bicuspid. The terminal phalanges were normal but rather small and rounded. The heart and lungs were negative and the thymus was not enlarged. The gall bladder was negative. The gastro-intestinal series showed the stomach to be negative except for a moderate amount of six-hour residue. There was slight dilation of the second position of the duodenum, possibly due to a low-grade obstruction which might have come from the gastric stasis. There was considerable colonic stasis at 24 hours, the barium being chiefly in the ascending colon and the hepatic flexure.

Case 15: X-rays of the skull showed that the sella was rather large but within normal limits and not eroded. The sinuses were large but normal. X-rays of the teeth showed unerupted third molars and considerable unfilled caries. Otherwise negative. The terminal phalanges were negative. The heart and lungs were negative and the thymus was not enlarged. The gall bladder was negative. The stomach was negative. There was moderate stasis in the terminal ilium. The appendix was long and much coiled. The colon was negative and fairly well emptied at 24 hours.

Case 16: X-rays of the skull showed the sella and sinuses to be normal. The teeth showed apical abscesses of the lower left first molar and upper left first bicuspid and pericementitis of the lower right first molar. The terminal phalanges were long and slender but otherwise negative. The heart was narrow, dropped type. The lungs were negative. Thymus was not enlarged. The gall bladder was negative. The stomach showed active peristalsis. The antrum filled poorly but without definite filling defect. There was no six-hour residue. The duodenal cap also filled rather poorly but apparently was negative. The small bowel was negative. There was considerable 24-hour colonic residue. There was moderate ptosis of the stomach and bowels.

Case 17: X-ray of the skull showed the sella and sinuses to be normal. There was a questionable bony plaque two inches long near the upper angle of the occiput, apparently lying in the cranial cavity. X-rays of the teeth showed that both upper cuspids were unerupted and malposed. Otherwise it was negative. The terminal phalanges were negative. The heart and lungs were negative and the thymus was not enlarged. The gall bladder was negative. The gastro-intestinal series showed that the stomach was long, dilated, ptosed and there was a small six-hour residue, about $\frac{1}{8}$ of the total amount. There was no filling defect. The duodenal cap and the small bowel were negative. There was considerable

colonic ptosis and stasis. The barium colon was half way to the splenic flexure in 24 hours.

Case 18: X-rays of the skull showed that the sella and sinuses were negative. The teeth were negative except for a questionable pericementitis of the lower left first molar. The terminal phalanges were negative. The heart was dropped type. The lungs were negative except for fairly distinct peribronchial thickening at the right base. The thymus was not enlarged. The gall bladder was negative. There was a broad linear shadow extending across the upper left on the right side. This might be due to a thickened pleura at the anterior side of the diaphragm. The gastro-intestinal series showed that stomach was negative except for a small six-hour residue, probably due to broken fast. The duodenal cap and the small bowel were negative. There was considerable 24-hour colonic residue. There was a bulbous appendix in the six-hour film.

Case 19: X-rays of the skull showed that the sella and sinuses were normal. The teeth showed a doubtful pericemental infection of the upper left cuspid and first bicuspid and upper right cuspid. The terminal phalanges were negative. The bones were rather long and slender. The heart was small, not markedly ptotic. The lungs were negative. The thymus was not enlarged. The gall bladder was negative. The gastro-intestinal series showed no filling defect, six-hour residue or ptosis of the stomach. The duodenal cap was extremely small and spastic, possibly due to ulcer or possible spasm due to extrinsic causes. No definite ulcer lesion but considerable irregularity on the right side of the base. There was moderate ilial stasis and apparent displacement of the terminal ilium by what appeared to be a pelvic mass. The colon was negative.

Case 20: X-rays of the skull showed the sella and sinuses to be normal. The teeth showed impacted lower left third molar and lower left second bicuspid. The upper right and left third molars were unerupted. The terminal phalanges were rather small and rounded. The heart and lungs were negative. The thymus was not enlarged. The gall bladder was negative. The gastro-intestinal series showed that the stomach was slightly ptosed and rather large. The duodenal cap filled poorly but showed no characteristic defect and was probably spastic. The small bowel was negative. The colon was slightly ptosed and contained a fairly large 24-hour residue in the tranverse position.

Case 21: X-rays of the skull showed the sella to be normal in size and shape but nearly bridged. The sinuses were negative. The teeth showed apical recession (pericementitis) of the upper left first bicuspid and cuspid. There was a questionable apical abscess of the upper left lateral incisor. There was recession anterior to the lower left first molar. The terminal phalanges showed rather flaring tips with a question of slight tufting. The heart was negative. The lungs showed peribronchial thickening, more marked at the right apex, probably due to tuberculosis. The thymus was not enlarged. The gall bladder was

negative. The liver edge was rather low. The gastro-intestinal series showed a filling defect of the antrum of the stomach evidently due to a rather low liver. There was the slightest possible six-hour residue. The appendix was unusually patent, long and large but not adherent. The colon was negative except for a small 24-hour residue.

Case 22: X-ray of the skull showed that the sella and sinuses were normal. The teeth were negative. The terminal phalanges were rather smooth and rounded. The heart was ptotic type. Otherwise negative. The lungs showed considerable peribronchial thickening, possibly due to tuberculosis but doubtful. The thymus was not enlarged. The gall bladder was negative. The gastro-intestinal series showed the stomach to be normal. The duodenal cap filled fairly well with no defects. The barium was present in the terminal ilium and ascending colon at six hours. At 24 hours the barium was chiefly in the rectum. There was a small amount in the colon generally.

Case 23: X-ray of the skull showed the sella and sinuses to be normal. The teeth showed impacted upper right and left third molars. The terminal phalanges were negative. The heart was rather small and of the drop type seen in ptosis. The lungs were negative and the thymus was not enlarged. The gall bladder was negative. The gastro-intestinal series showed that the stomach was somewhat atonic and slightly dropped. No filling defect or six-hour residue was made out. The duodenal cap showed pressure defect on several films (pressure against under surface of liver). At six hours the barium was all in the terminal ilium and the proximal half of the colon. At 24 hours much of the barium had passed. There was still some in the proximal half of the colon and in the rectum.

Case 24: X-ray of the skull showed the sella and sinuses to be normal. X-ray of the teeth showed a rudimentary tooth between the apices of the upper central incisors. There was an apical abscess of the upper right first bicuspid. The terminal phalanges were negative. The heart and lungs were negative. The thymus was not enlarged. The gall bladder was negative. The gastro-intestinal series showed the stomach to be negative except for slight ptosis and slight dilatation. There was no six-hour residue. The small bowel was negative. The colon was negative except for moderate ptosis and slight 24-hour delay. There was no obstruction.

Basal Metabolism

Case No.			
1.....	—5		
2.....	—1		
3.....	—13	—14	—11
4.....	+2	+6	
5.....	—5		

Case No.			
6	—7		
7	—20	—30	—38
8	—10		
9	—11		
10	100		
11	—28		
12	—12		
13	—17		
15	—10	—14	
16	—5	—6	
17	—11	—36	
18	—15		
19	—22		
20	—3		
21	+14	—1	+4
22	+1	+3	—4
23	—17		
24	+11	+3	—10

Blood Sugar Curves

Case No.	Fasting blood mgm. glucose per 100 c.c.	1 hour after glucose feeding	2 hours after glucose feeding	3 hours after glucose feeding
1	88	130	120	66
2	82	110	82	67
3	105	78	73	97
5	91	105	71	75
6	96	185	132	127
7	106	152	88	119
8	118	146	150	84
9	100	148	111	107
11	103	174	125	74
12	90	150	182	154
13	88	131	114	107
14	85	103	107	99
15	95	163	106	115
16	100	228	278	206
17	85	146	109	84
18	85	91	78	64
19	93	168	109	83
20	85	126	118	111
21	98	145	93	107
22	89	141	138	102
23	103	179	111	75
24	99	183	179	133

Galactose Tolerance Test

Case No.	1st 2 hour urine spec.	2nd 2 hour urine spec.
2	V.S.R.	0
3	V.S.R.	0
6	.81 gm.	0
7	3.29 gm.	S.R.
8	.82 gm.	V.S.R.
9	.20 gm.	0
11	S.R.	0
12	S.R.	0
13	V.S.R.	0
14	.18 gm.	V.S.R.
15	.14 gm.	S.R.
16	.21 gm.	V.S.R.
17	.18 gm.	S.R.
18	S.R.	0
19	.86 gm.	.22
21	.88 gm.	V.S.R.
22	.72 gm.	0
23	1.87 gm.	V.S.R.
24	.87 gm.	V.S.R.

Blood Chemistry

Mgms. per 100 c.c.

Case No.	Non-Protein Nitrogen	Urea Nitrogen	Uric Acid	Creatinine	Amino Acid Nitrogen	Rest Nitrogen	Fasting Blood Sugar	Calcium	Phosphorus	Chlorides
1	19.8	7.1	3.2	1.2	9.1	2.2	88.	11.4	..	..
2	24.0	7.0	3.1	1.3	7.9	7.6	82.	11.2	4.9	495
3	25.9	8.2	3.2	1.2	6.2	10.1	105.	11.3	4.9	455
4	23.8	7.4	2.5	1.4	..	..	89.	8.6	3.7	..
5	30.9	10.9	3.2	1.3	8.0	10.5	91.	12.6	5.0	455
6	27.7	9.5	4.0	1.4	7.5	8.9	96.	..	4.3	505
7	28.8	8.4	5.7	1.5	8.3	9.7	106.	12.0	5.4	595
8	29.6	10.0	3.6	1.4	7.9	10.0	118.	11.7		488
9	30.9	6.7	3.2	1.3	6.9	15.8	100.	11.7	3.4	475
10	27.3	10.9	2.9	1.3	6.7	8.2	..	13.6	..	455
11	21.6	9.3	3.6	1.2	6.0	4.6	103.	11.0	4.0	487
12	25.6	8.3	3.3	1.4	5.0	10.8	90.	11.0	5.7	464
13	34.5	11.8	3.7	1.8	7.3	13.8	88.	10.8	6.0	475
14	24.5	5.3	2.8	1.4	5.4	12.8	85.	10.7	4.1	410
15	23.3	7.8	4.4	1.2	5.0	8.6	95.	10.2	2.9	485
16	28.8	10.6	4.6	1.2	4.8	11.4	100.	8.9	5.2	473
17	24.7	..	3.5	1.5	..	..	85.	11.0	4.1	481
18	30.6	..	2.8	1.2	5.5	..	85.	10.8	5.0	465
19	26.7	..	2.9	1.4	6.8	..	93.	11.2	3.2	459
20	27.3	..	3.9	1.0	6.8	..	85.	11.4	7.5	437
21	25.9	7.1	2.8	1.4	7.4	10.0	98.	9.1	5.2	475
22	27.3	9.9	2.6	1.4	7.6	8.4	89.	13.4	4.9	475
23	23.6	8.7	2.7	1.6	6.0	7.5	103.	14.0	4.9	455
24	24.8	6.2	3.2	1.2	6.1	11.1	99.	11.1	4.9	515

Blood Counts

Case No.	Hb.	R.B.C.	W.B.C.	Polys.	Large Lymph	Small Lymph	Eos.	Trans.	Bas.	Mast. Cell	Sm.
1...	90T	5,448,000	9,000	61	2	33	..	4	..	..	Nor.
2...	90T	4,848,000	7,100	64	2	30	1	..	..	..	Nor.
3...	85T	4,080,000	8,600	69	7	17	..	4	3	..	*
4...	80T	4,160,000	9,000	65	2	31	..	2	..	..	†
5...	100T	5,364,000	11,300	61	..	26	..	3	..	..	Nor.
6...	85T	4,656,000	9,200	68	5	30	..	..	..	..	‡
7...	90T	5,520,000	8,100	70	1	26	1	2	..	..	Nor.
8...	90T	4,880,000	10,700	72	..	26	..	2	..	..	Nor.
9...	90T	4,296,000	8,500	60	5	30	..	2	..	..	Nor.
10...	85T	5,616,000	14,500	54	4	38	3	1	..	..	Nor.
11...	85T	5,816,000	10,300	58	2	49	1	..	..	..	Nor.
12...	90T	4,832,000	12,900	70	6	22	2	..	..	..	Nor.
13...	75T	5,270,000	5,500	66	..	43	..	1	..	..	Nor.
14...	85T	4,630,000	8,500	71	..	25	1	..	..	..	Nor.
15...	75T	3,770,000	8,400	37	2	51	3	2	..	1	Nor.
16...	80T	5,680,000	15,000	70	..	26	..	3	..	1	Nor.
17...	90T	4,280,000	10,000	72	1	26	..	..	..	..	Nor.
18...	75T	3,960,000	8,500	54	2	32	..	..	..	..	§
19...	90T	4,860,000	7,400	70	1	27	..	2	..	..	Nor.
20...	80T	5,630,000	10,800	65	1	30	3	..	..	1	Nor.
21...	90T	5,152,000	11,100	75	1	21	1	2	..	..	Nor.
22...	85S	4,800,000	7,100	73	3	24	..	..	..	..	Nor.
23...	81S	5,792,000	9,700	66	1	33	..	..	..	..	Nor.
24...	85T	4,000,000	11,800	74	3	21	..	1	1	..	Nor.

* Slight poikilocytosis.
† Slight achromia.
‡ Slight anisocytosis.
§ Anisocytosis.

Kottman Reaction

Case No.	Light Color Change	Light Brown	Brown	Dark Brown	Remarks
1..	Not recorded	3 min.	5 min.	8 min.	Accelerated
2..	2½ min.	5 min.	Not recorded	7½ min.	
3..	2½ min.	5 min.	10 min.		
4..	5 min.	7 min.	10 min.		
5..	5 min.	6 min.	10 min.		
6..	20 min.	30 min.	Over 1 hour		Retarded
7..	7½ min.	10 min.	15 min.		
8..	7 min.	10 min.	15 min.		
9..	Very quick	2½ min.	5 min.		Accelerated
10..	8 min.	10 min.	15 min.		
11..	10 min.	15 min.	20 min.		Serum
12..	5 min.	7½ min.	10 min.		slightly
13..	2½ min.	5 min.	7½ min.		hemolyzed
14..	5 min.	7½ min.	10 min.		
15..	7½ min.	10 min.	15 min.		
16..	2½ min.	5 min.	10 min.		
17..	2½ min.	5 min.	7.5 min.		
18..	5 min.	7½ min.	10 min.		
19..	7½ min.	10 min.	12.5 min.		
20..	5 min.	10 min.	17 min.		
21..	20 min.	30 min.	40 min.		
22..	2½ min.	Not recorded	7½ min.		
23..	2½ min.	Not recorded	7½ min.		

Spinal Fluid

Case No.	Fasting* Blood Sugar	Spinal* Fluid Sugar	Total* Protein	Glob.	Cells	Gold	Wassermann
1.....	67	59	28	0	0	Neg.	Negative
2.....	98	71	18	0	2	Neg.	Negative
3.....	89	68	22	0	0	Neg.	Negative
4.....	91	77	18	0	0	Neg.	Negative
6.....	104	69	24	0	0	Neg.	Negative
7.....	106	80	20	0	0	Neg.	Negative
8.....	99	72	18	0	0	Neg.	Negative
9.....	109	60	36	0	4	Neg.	Negative
11.....	96	73	35	0	1	Neg.	Negative
12.....	78	60	19	0	0	Neg.	Negative
13.....	95	55	27	0	0	Neg.	Negative
14.....	73	49	41	0	0	Neg.	Negative
15.....	109	63	53	0	0	Neg.	Negative
16.....	99	53	22	0	0	Neg.	Negative
18.....	85	62	29	0	3	Neg.	Negative
19.....	81	51	33	0	0	Neg.	Negative
20.....	101	57	30	1*	2	Neg.	Negative
21.....	84	60	22	0	0	Neg.	Negative
22.....	118	64	20	0	0	Neg.	Negative
23.....	131	80	29	0	0	Neg.	Negative

* Mgms. per 100 c.c.

Gastric Analysis

Case No.	Free HCL F.C.	Free HCL 1 hr.	Total Acidity F.C.	Total Acidity 1 hr.	Microscopical F.C.	Benzidene F.C.	Benzidene 1 hr.
2...	0	35	8	64	Ep. cells. W.B.C.....	0	0
3...	48	52	90	96	Bacteria. No Boas-Oppler.		
5...	0	0	8	6	Ep. cells. Occ. W.B.C.	0	
6...	0	—	0	—	Ep. cells. Occ. W.B.C.	0	1 hr. not done
7...	0	11	10	36	Ep. cells. Occ. W.B.C. Occ. R.B.C.	+	0
8...	0	27	12	34	Ep. cells. Rare R.B.C. Starch granules	+	0
9...	0	3	6	42	Gross blood. Many R.B.C.	++	0
11...	0	26	1	54	Occ. ep. cells. Rare W.B.C. Occ. Bacteria. No Boas-Oppler.	±	0
13...	15	40	27	72	Ep. cells. Rare R.B.C.	+	0
14...	30	30	40	60	R.B.C. Ep. cells.....	+	0
16...	0	6	7	63	Ep. cells; yeast; W.B.C. B. Boas-Oppler.		
18...	16	34	24	62	Negative.	0	
19...	26	30	41	65	Occ. ep. cells; Occ. R.B.C.	0	0
20...	0	10	5	70	Many ep. cells.....	0	
22...	28	26	46	44	Occ. ep. cells.....	0	0
23...	23	47	34	65	Negative.	0	0

Phthalein
Renal Function

Case No.	% excreted in 2 hrs. 10 min.
3	42
5	58
6	74
7	53
8	38
9	70
11	46
12	55
13	60
14	80
15	80
16	64
17	75
18	70
19	45
21	53
22	72
23	80
24	68

Oculocardiac Reflex
Pulse Variations

Case No.	Degree of Variation	Time of Greatest Variation	Time of Return to Normal
1	+ 5	4	?
2	— 6	4	5 minutes
3	— 7	4	6 minutes
4	— 2	3	4 minutes
5	—50	4	?
9	— 6	3	4 minutes
11	—12	5	?
12	+ 2	2	3 minutes
13	— 8	3	6 minutes
14	+ 4	3	?
15	—16	3	?
16	— 2	2	6 minutes
17	—16	3	?
18	— 6	3	5 minutes
19	— 4	2	6 minutes
20	— 6	3	5 minutes
22	— 6	3	6 minutes

Cardio-Ocular Reflex
Blood Pressure Changes

Case No.	Systolic	Diastolic	Pulse Pressure	Tune of Greatest Variation	No. of Reading when Returned to Normal
1....	0	0	0	0	0
2....	—18	+ 2	—20	4th reading	?
3....	— 4	+10	— 8	4th reading	8th minute
4....	+ 2	— 2	+ 4	2nd reading	6th minute
5....	—10	+12	—22	7th minute	?
9....	+ 2	0	+ 2	2nd reading	6th reading
11....	—10	—14	— 4	2nd reading	not back in 20 minutes
12....	—10	0	—10	3rd reading	6th minute
13....	—12	0	—12	4th reading	not back in 10 minutes
14....	— 4	+ 4	— 8	7th reading	5th reading
15....	— 8	+ 4	—12	6th reading	not back in 15 minutes
16....	+ 2	+ 4	+ 2	3rd reading	14th reading
17....	—12	+10	—22	12th reading	not back in 15 minutes
18....	+10	+ 6	+ 4	2nd reading	not back in 15 minutes
19....	— 8	0	— 8	10th reading	12th reading
20....	— 2	0	— 2	2nd reading	?
22....	+ 2	0	+ 2	6th reading	7th reading

Discussion

The X-ray studies revealed a number of interesting findings. The X-rays of the skull were negative in practically all cases. The sella turcica was nearly bridged in three cases but in no case was there any erosion and there was nothing to indicate a definite disorder of the pituitary gland. The sinuses were negative in all except one case and in this case it is probable that the infection occurred by the patient stuffing foreign bodies up the socket of the tooth. In one case in which there was a history of head injury there was an area of bone thinning which was regarded as of possible traumatic origin. X-rays of the teeth were taken in twenty-two cases. In only five cases were the findings completely negative. Apical abscesses were found in seven cases and two other cases showed pericementitis. Four more cases showed questionable infections of the teeth. Impacted, malposed and unerupted teeth were found in a number of cases. Examination of the terminal phalanges showed definite tufting in one case and questionable tufting in two others. The heart was X-rayed in twenty-three cases and was considered normal in fourteen cases. In seven cases the heart was of the "dropped" type and in two other cases the heart was considered as "long and narrow." The lungs were X-rayed in twenty-three cases and were

reported as negative in sixteen cases. Three cases showed questionable tuberculosis. One case showed healed tuberculosis and three cases showed peribronchial thickening. There was no abnormal thymus shadow in any case. The X-ray of the gall bladder was negative in every case. The gastro-intestinal series were taken in twenty-two cases. It is difficult to state exactly when findings may be considered as abnormal and there is considerable dispute as to the meaning of colonic stasis. As interpreted by the roentgenologist only two cases were marked as absolutely negative. In no case was a definite organic condition such as ulcer, cancer or adhesions diagnosed, although in one case the question of ulcer was raised. By all accepted criteria twelve cases could be regarded as showing definite functional disorders and in eight more cases there were such conditions as ptosis or colonic stasis, concerning which the interpretation is very difficult. A filling defect of the stomach was noted in seven cases and in six cases there was a six hour residue. Fifteen cases showed colonic stasis of varying degree and two more cases showed ilial stasis.

The basal metabolism was done in twenty-three cases and eleven or 48 per cent showed an abnormally low basal metabolism. Ten more cases or 43 per cent showed readings from -10 to -1. In the other two cases the basal metabolism was 100 per cent in one case and $+2$ in the other. Twenty-one cases out of twenty-three therefore, showed minus readings and only one a plus reading. This would indicate a definite tendency towards a low basal metabolism in schizophrenia.

The blood sugar curve was done in twenty-two cases. It is difficult to define the limits of the normal blood sugar curve with any degree of precision but roughly twelve cases showed a normal curve, nine cases showed a high sustained type of curve, and one case showed a reversed type of curve. Slightly less than half of the cases, therefore, showed an abnormal blood sugar curve.

The galactose tolerance test was done in nineteen cases. According to Rowe the finding of 3/10 of a gram in the urine indicates a decreased gonadal function. Eight cases, all females, gave a positive test.

The chemical examination of the blood included the determination of the nonprotein nitrogen, urea nitrogen, uric acid, creatinin, amino acid nitrogen, rest nitrogen, fasting blood sugar, calcium, phosphorus and chlorides. In general it can be stated that the findings were within normal limits in practically all cases and that a study of the

blood chemistry in Schizophrenia shows no deviation from the normal.

Blood counts were made in all cases and in general were within normal limits. In one case there was a slight reduction of the hemoglobin and the red cell count. Six cases showed white cell counts of between eleven and fifteen thousand on the first examination but later counts were within normal limits. The differential counts and the stained blood films showed nothing of importance. It would seem that the cellular elements of the blood in schizophrenia are essentially normal.

Kottman,(9) in 1920, demonstrated a serum reaction which he claimed varied with the activity of the thyroid. The increase or decrease of the function of the gland was assumed to affect the protective colloidal property of the blood serum of the patient, and this property in turn affects a certain photochemic reaction of the serum by means of which, according to his hypothesis, the thyroid activity could be measured. The Kottman reaction was done in twenty-three cases with unusually rigid technique. The results showed a fair degree of uniformity and gave what for Kottman would be a normal reaction. Further studies made at this hospital by Kasanin and Knapp (11) have convinced us that the Kottman reaction is quite unreliable and without much significance.

The spinal fluid was examined in twenty cases and showed nothing anomalous. It is perhaps worth while summarizing the quantitative sugar and total protein findings. The spinal fluid sugar varied from 49 to 80 mgms. and the average was 64 mgms. The total protein varied from 18 to 53 mgms. In all but two cases it was below 37 mgms. The average was 27 mgms.

The gastric contents were studied in sixteen cases. There was an absence of free hydrochloric acid in the fasting contents of nine cases or 56 per cent. A positive benzidene test for occult blood was obtained in five cases or 31 per cent. These findings would strongly suggest a functional disorder of the stomach and tend to confirm the X-ray findings.

The phenolsulphonephthalein test for kidney function was normal in all cases.

The oculocardiac reflex was undertaken in an attempt to find an easily applicable clinical method of investigating the tone of the vegetative nervous system. First noticed by Wagner von Jauregg as a means of rousing patients in a stupor it was taken up by Aschner who noticed that pressure on the eyeball influenced the rate of the pulse and repiration. It has of late been worked at by many observers

without showing any very definite or well characterized reactions from which one can draw very definite conclusions. The general conclusion, however, has been that in an individual with a normal vegetative nervous system the pulse and respiration were slowed and the blood pressure raised. In a vagotonic individual the slowing would seem to be greater and in a sympatheticotonic individual the rate might even be increased. Guillaume has termed neurotonics a group which may show mixed or paradoxical results.

The results of the oculocardiac reflex were not very conclusive. The majority of cases fell within the limits of the normal. There were some variations in both directions, that is to say, in some cases the pulse and respiration were increased instead of being slowed and the blood pressure was decreased instead of being raised while in other cases the usual response of a slowing of the pulse and respiration and a raising of the blood pressure went beyond the limits of the normal. If we accept the common interpretation of this phenomenon it would show that the majority of the cases of schizophrenia do not show an anomalous vegetative nervous system but that in a few cases there was evidence of vagotonia and in a few other cases there was evidence of sympatheticotonia. The conclusion would be that there is no constant disorder of the vegetative nervous system in schizophrenia.

(*To be continued*)

SUBARACHNOID HEMORRHAGE FROM A MEDICO-LEGAL POINT OF VIEW.[1]

By Willy Munck, M.D.

of copenhagen

Legal autopsies very often afford an opportunity of judging the rôle which intracranial hemorrhages play as direct or indirect causal agents of death.

By way of example it may be mentioned that, among 1,009 legal obductions performed at this institute during the period from 1910 to 1925, there were 139 cases of intracranial hemorrhage, *i.e.,* 13.5 per cent.

The interest attached to these hemorrhages manifested itself not long ago in this country by their being chosen the subject for an obligatory lecture at the competition for the professorship of medical jurisprudence at the University of Copenhagen, and the reader is referred to Professor Knud Sand's lectures on this subject published in "Ugeskrift for Læger," No. 6, 1926.

In most of these cases there is a question of severe traumatic lesions of the head with fracture of the skull and contusion of the brain, *i.e.,* cases where the cause of death, the starting-point of the hemorrhage and the causal relation between the trauma and the hemorrhage are very easy to account for.

In those cases, however, where the hemorrhage is the only change evidenced by the autopsy and, thus, neither fracture of the skull nor contusion of the brain can be found, it may be extremely difficult to determine the importance that should be attached to a possible trauma as a causal agent of the hemorrhage, as well as the whole mechanism of the hemorrhage may be very difficult to understand.

This applies particularly to those hemorrhages which form the subject of this work, *viz.,* the isolated subarachnoid hemorrhages.

There has been a series of such hemorrhages at the Medico-legal Institute, and, as they presented very particular conditions I feel justified in subjecting this particular form of intracranial hemorrhage to a closer examination.

[1] From the Institute of Medical Jurisprudence, University of Copenhagen, Denmark (Chief Professor Kund Land, M.D.)

To begin with I must, however, make a few orientating anatomical remarks.

According to their anatomical localization the intracranial hemorrhages may be classified in different groups:

1. *Epidural Hemorrhages,* where the blood extravasation is found between the dura and the skull.

2. *Subdural Hemorrhages,* where the extravasation is found between the Dura and the arachnoidea.

3. *Subarachnoid Hemorrhages,* where the extravasation is found between the arachnoidea and the cortex cerebri.

Some authors distinguish besides between subarachnoid, pial, and subpial hemorrhages. In my opinion, however, such a distinction cannot possibly be followed out in practice.

The arachnoid and pia, which are treated separately in descriptive anatomy, are actually not to be distinguished from each other from a topographic point of view, as they are connected with each other by means of pillars of connective tissue in such a manner as to render it very difficult to separate them; and it is often quite impossible macroscopically to determine whether a pathological process has its seat in the arachnoid or in the pia, or between them. As for the construction of the arachnoid Froin states that it consists of two layers, *i.e.,* a parietal layer and a visceral layer. The parietal layer consists of a sheet of endothelial cells which cover the inside of the dura. The visceral layer consists of a thin, transparent membrane which is connected with the pia by means of pillars of connective tissue, strongest on the convexity, less on the base. The arachnoid extends across the large sulci between the various sections of the brain and contains but few vessels, while the pia, which extends downward into the sulci, is rich in vessels. Both together confine the subarachnoid space. In various places, especially at the basis, where the arachnoid membrane makes a bridge across large and irregular parts, large cisterns are found, such as, for instance, cisterna cerebellomedullaris, between the basal side of the cerebellum and the upper side of the medulla oblongata; by means of Magendie's foramen this space is connected with the fourth brain ventricle, a circumstance which, as will be seen later, is of great importance in cases of hemorrhage here. Of other cisterns may be mentioned the cisterna interpeduncularis, between the basis of the pedunculi cerebri. In this space lies the circulus arteriosus (circle of Willis). The subarachnoid space extends downward around the spinal marrow to the first and second sacral vertebra.

Now, if a hemorrhage takes place from one of the vessels into

this rather large space, it will, in by far the majority of cases, attain a rather characteristical localization of chiefly coagulated blood, preferably localized toward basis cerebri, where it envelops the larger vessels lying here and, partly, the optic chiasm and the anterior surface of the pons. The blood extravasation usually gains entrance into the larger sulci, particularly into the sylvian fossa, and as a rule, it decreases quite symmetrically in thickness from the basis upward to the convexity of the brain. In some cases the hemorrhage has a less symmetrical localization, now and again being quite unilateral and covering smaller or larger areas of the convexity of the brain. If the hemorrhage be localized to the base of the brain, one also finds blood in the cisterna cerebellomedullaris and in the subarachnoid space around the spinal marrow, as a rule preferably around its lowest part; and, finally, there is frequently found blood in one or several of the cavities of the brain, sometimes to such a degree as to fill these completely with blood-clot. As a rule, the greatest quantity of blood is found in the fourth ventricle, while there is less in the third ventricle, and the smallest quantities are found in the lateral ventricles, thus conveying the distinct impression that the blood has gained entrance from the outside through Magendie's foramen into the fourth ventricle and, thence, into the other cavities. It will, of course, happen rather frequently that the blood, owing to rupture in the arachnoid, also invades the subdural space, where it is able to spread still more easily and more rapidly over a vast portion of the brain. However, in this work I shall confine myself to the isolated subarachnoid hemorrhages and, therefore, not enter upon such factors as may prevail in cases of a combination of a subdural and subarachnoid hematoma.

The starting-point of these subarachnoid hemorrhages is very varying. It is natural at first to mention the rupture of aneurismatic dilatations of the basal arteries of the brain, where the blood extravasation very frequently is just localized subarachnoideally. That these aneurisms are by no means rare is evidenced by the great foreign statistics, such as, for instance, Beadle's (1907) containing 555 cases; Busse's (1920), 400 cases; Hey's 367 cases, 6 of which in the first decade and 33 in the second. Kolisko states that, among the annual number of about 1000 "sanitätspolizeiliche Sektionen" (sanitary police autopsies) at Vienna's medico-legal institute, there are, as a rule, found 10 cases of ruptured aneurisms, such being also mentioned by other medico-legal authors (Brouardel, Schmidtmann, Balthazard). Fearnsides (1916) in a series of 5,432 autopsies, found 44 aneurisms, that is to say, 0.80 per cent. In the Danish medical

literature such cases have been described by Harald Møller (1922) Thorvald Petersen (1921) and Poul Møller (1921). Aneurisms are preferably localized to the internal carotid artery close to its point of parting to the ramus communicans anterior (10 per cent, Busse), and to the point of parting of the basilar artery.

Aneurisms are often very small and almost impossible to demonstrate macroscopically, particularly those which are localised to the bottom of the sylvian fossa. Still, here the distribution of the blood extravasation may possibly give a hint as to the site of the aneurism.

The origin of these aneurisms is attributed partly to local degenerative changes in the vessels, partly to local inflammatory changes and, finally, to an inborn defect in the arterial wall.

However, aneurismic dilations are by no means always found at that point of the artery which is ruptured. The rupture is seen to occur in places with arteriosclerotic changes, such as, for instance, small atheromatous patches, or in places with syphilitic changes.

In other cases one may meet with the rupture of an artery though without being able, either macroscopically or microscopically to detect any changes in the ruptured place, all the vessels having quite a normal aspect.

Another source of the hemorrhages is the rupture of pial veins. However, these are as a rule very difficult to detect. They are relatively frequently met with in cases of subarachnoid hemorrhages in newborn children. C. O. Hedrén in his paper on "delivery-traumatic intracranial hemorrhages in newborn children," reports no less than 11 cases of isolated subarachnoid hemorrhages of this origin. The ruptures in the veins are often localized quite above at their point of inosculation into the longitudinal sinus. Such hemorrhages are not infrequently seen after rapid and easy deliveries (Seitz).

On other rare sources of subarachnoid hemorrhages may just be mentioned such as, for instance, effusion of apoplectic hemorrhages to the surface of the brain, hemorrhages in hemophilia, eclampsia, insolation, and malignant anthrax.

It happens frequently, however, that one meets with cases—and those are just the most difficult and puzzling ones—where one is unable, even after the most careful examination, to determine the starting-point of the hemorrhage. Ehrenberg (1912) who has collected 31 cases of spontaneous subarachnoid hemorrhage, relates 15 dissected cases in but three of which he succeeded in determining the starting-point of the hemorrhage. Symonds (1924) has collected 124 cases of spontaneous subarachnoid hemorrhage, in 41 of which

the starting-point of the bleeding could not be detected. Similar observations have been made by other authors (Harbitz).

The medico-legal interest is of course particularly attached to the question as to which factor has given rise to the hemorrhage.

There is no doubt, especially after Ehrenberg's and Symond's works, that isolated subarachnoid hemorrhages are capable of arising quite spontaneously. Ehrenberg has collected 31 such cases. In some of these an increase of the blood pressure could be detected, a factor which no doubt deserves some attention. Vaques and Esmein speak directly of "épistaxis meninguée" (meningeal epistaxis), corresponding to epistaxis, purpura and retinal hemorrhage with increased blood pressure. Schrøder (1919) emphasizes the importance of kidney diseases associated with increased blood-pressure for the causation of the hemorrhage.

As has been related, Symonds has not less than 124 cases of spontaneous subarachnoid hemorrhage and gives a very ample survey of the problem, viewed particularly from a clinical point of view. He is of opinion that, in a far greater number of cases than those successfully stated, the hemorrhages are due to the rupture of small aneurisms on the vessels of the brain.

The immediate cause of such a "spontaneous" hemorrhage very frequently is some or other acute increase of the blood pressure, such as, for instance, may arise from bursts of anger, pressure during defecation, coition, or the like; however, there are several instances known, where hemorrhages occur, while the patients are lying quietly in their beds.

The second chief group is formed by the subarachnoid hemorrhages of traumatic origin. These are certainly very frequent, if one includes all the lesions of the head.

Demoulin (1902) goes as far as claiming that "tout traumatisme cranien d'une certaine intensité epeut s'accompaugner d'hémorrhagie dans l'espace sousarachnoidien." Froin states that, in every 5 cases of head traumatism with hemorrhage in the subarachnoid space, one encounters one without hemorrhage. Nor are the isolated hemorrhages, that is to say, subarachnoid hemorrhages without contusion of the brain and fracture of the skull, of rare occurrence after traumatism.

As regards the aspect and localization of the traumatic hemorrhages it is often quite impossible (from a pathologico-anatomical pont of view) to distinguish them from spontaneous hemorrhages, though, as a general rule, it may be said that the latter are never localized to the convexity of the brain alone. In most cases will

absolute certainty of the traumatic origin of the hemorrhage only be available through the examination of the lesions of the soft parts of the skull in connection with the anamnestic data (according to the case reports, police report, etc.).

After these orientating remarks, which should convey an idea of the great importance these hemorrhages have acquired in recent years, I shall now proceed to describe my own material which consists of 9 cases of isolated subarachnoid hemorrhages.

Seven of these cases were examined at the institute of medical jurisprudence in Copenhagen, the other two at the pathological institute of the Rikshospital in Oslo; for these two I am indebted to Professor Francis Harbitz, M.D., who has kindly submitted them to me.

Case I (Institute of medical jurisprudence): A woman, aged forty-four; admitted to the mental hospital at M. on 21/VII, 1914. Hospital diagnosis: Dementia precox. Suffered much from sleeplessness and has received a good deal of soporifics. On the 24/IV, 1915, she took her morning tea at 8 A.M., got up afterwards in order to wash and do her hair, and went to bed again. At 9 A.M. she suddenly collapsed in bed and died a moment later. The post-mortem examination performed on 24/IV revealed the following conditions: No hemorrhages in the soft parts of the skull, no fracture of the cranium. The hard membrane of the brain normal. There is no free hemorrhage in the subdural space, but a hemorrhage is found below the soft membranes, increasing downward toward the base, particularly marked around chiasma, pons and medulla oblongata, and filling the spaces between these formations. There is nothing abnormal in the cerebral tissue. The fourth ventricle is completely filled with blood clot. The vessels on the base of the brain present nothing abnormal. The remainder of the autopsy reveals nothing of interest.

Case II (Institute of medical jurisprudence): A man, aged sixty-two, was found 24/III, 1916, lying dead in a doorway in N. street. A quarter of an hour previously he had been in a tavern where he had taken a glass of beer. There was nothing which could have thrown any light on the case, particularly nothing with regard to a traumatism of the head.

Post-mortem examination of 27/III, 1916. No wounds on the skin, no echymoses, especially not on the head. The basal arteries of the brain extremely sclerotic, though not contracted, and without detectable sack-shaped (aneurismatic) dilatations or ruptures. A large subarachnoid hemorrhage is found, most severe at the base around pons, extending upward both sides and forming a layer of up to ½ cm. thickness. There

is no hemorrhage in the brain tissue itself and no blood in the ventricles. The remainder of the autopsy revealed nothing of interest.

Case III (Institute of medical jurisprudence): Farming servant, aged fifteen. Both bodily and mentally he is said to have been below the average, being of a violent and spiteful disposition; he has not had any special diseases. On 29/IX, 1916, he dines with a good appetite together with the fellow servants. He is reported to have told another boy that he felt a little sick, though without stating what his indisposition was like. It is stated that, at about 4 P.M., there did not seem to be anything particular the matter with him; since then nobody has seen him until, on 30/IX, about 2 P.M., he was found dead behind a fence in the field. He lay in the grass, face downward, up against a mound. His trousers were unbuttoned, and behind him were found some soft excreta, a little of which was also found in his trousers.

Autopsy 30/X, 1916. Besides superficial chaps in the face there was no sign of external violence, especially no ecchymoses on the head. There was no fracture of the skull; this had a peculiar shape, being flattened from the vertex downward to the neck. The dura is normal; no hemorrhage between dura and cranium, but a diffuse hemorrhage is found extending across the whole surface of the cerebrum below the soft membranes, spreading very particularly on the base of the brain around pons and chiasma, as well as on the little brain and downward around the medulla oblongata. There is much blood in the third and fourth ventricle, as well as in the right lateral ventricle. There is no sign of contusion of the brain; the vessels at the base of the brain are normal, and one is not successful in finding any ruptured vessel. The remainder of the autopsy reveals nothing morbid, particularly no symptoms of syphilis.

Case IV (Institute of medical jurisprudence): A man, aged thirty-five. On 3/IX, 1922, the deceased together with two other men had drunk a great deal of alcohol at B. inn. They were expelled from the inn at 5 P.M. During a subsequent quarrel the deceased received a strong blow with the fist on his left jawbone. According to the explanations given by his comrades they had found him lying face downward on a soft field, when they had turned round a little afterwards to see what had become of him. He was then dead. The autopsy performed on the 5/IX revealed the following conditions: At the border of the left side of the under-jaw a wound was found, measuring 2 mm., and surrounded by ecchymoses. The hard cerebral membrane was normal. At the base a very abundant hemorrhage was found below the soft membranes. No hemorrhage in the brain substance, but there is blood in the third ventricle and in the lateral ventricles. The cerebral vessels are normal. The starting point of the hemorrhage could not be detected. The remainder of the dissection revealed nothing of interest.

Case V (Institute of medical jurisprudence): A woman, aged

sixteen. She was found dead on the high road on 12/II, 1923. About an hour previously she had left her place cycling and apparently well. She lay on her back, with arms and legs a little sideways close to a heap of broken stones. Her bicycle lay beside her toward the stone heap. She is reported to have consulted a physician a fortnight previously because of a stomach complaint (?), has suffered from giddiness. The post mortem examination on 14/II, 1923, revealed the following conditions: On the neck was found an ecchymosis of the size of a 2-kr. piece in the soft parts of the cranium. No fracture of the cranium, dura normal; however a considerable ecchymosis is found in the soft membrane of the brain, extending over an area nearly as large as the palm of a hand, corresponding to the most salient part of the right parietal lobe. No ruptured vessels were detected in the pia. The brain tissue was normal. The remainder of the autopsy revealed nothing abnormal.

Case VI (Institute of medical jurisprudence): A boy, aged fourteen. On 24/IV, 1925, at a football ground, he had got into a quarrel with a young man who suddenly gave him a slap in the face with the back of his left hand (it being unknown, whether the hand was clinched or not), hitting him on the right cheek and under-jaw. Several witnesses declared that it was absolutely not a strong slap. The deceased stared a moment at the man and without uttering a cry, ran away. After having run about 17 m., he fell to the ground, face downward. A physician who was present stated that he was dead.

The post mortem examination performed on 25/IV, 1925, revealed no external lesions. No fracture of the skull. Dura normal. No hemorrhage in the subdural space. However a rather extensive hemorrhage is found in and below the soft membranes, particularly localized to the base of the brain, around chiasma, pons, cerebellum and medulla oblongata, decreasing from this point symmetrically upward on both sides. The brain tissue normal. There is blood in all the cavities of the brain, particularly in the fourth ventricle. The vessels are all normal, and, particularly, no aneurisms are observed. The starting point of the hemorrhage is not found in spite of minute examination. The spinal marrow is removed in close connection with the examination of the brain; a very abundant hemorrhage is found in the subarachnoid space, especially in the lowest part. The spinal marrow is normal. No fracture of the columna. The remainder of the autopsy presented nothing of interest.

Case VII (Institute of medical jurisprudence): A man, aged forty-five. On the 17/V, 1925, during a quarrel at a tavern, he received a slap on the right jaw from one of his companions; the slap is said not to have been strong. He stood for ½ minute, whereupon he collapsed and fell to the ground. He did not knock his head in falling. As he did not give any sign of life after the lapse of a couple of minutes, he was

taken to the hospital, where it was stated that he was dead. It is reported that he had drunk much alcohol that day.

The autopsy performed on 18/V, 1925, revealed: No external sign of violence. Dura normal. There is found a diffuse subarachnoid hemorrhage of considerable extension, strongest at the base, decreasing symmetrically upward on both sides. There is blood in all the cavities of the brain. The brain tissue is normal. There is a little sclerotic degeneration of the carotis int. (on both sides). In no place, however, can ruptures or dilations be detected. There is found blood in the whole subarachnoid space along the spinal marrow, particularly downwards. The spinal marrow normal. The remainder of the autopsy revealed nothing abnormal.

Case VIII (Professor Harbitz): A man, aged twenty-five. He had drunk much alcohol in the course of the afternoon and evening on 14/XI, 1924. About 11 P.M. he met several men with whom he got into a quarrel, during which he fell down in the street. It is not known whether he was hit by anybody. He immediately become unconscious and was at once taken to the sanitary station, but was then dead. He is reported to have been given to drinking and to have had delirium tremens a couple of times.

Autopsy on 15/XI, 1924. No external lesions. No fracture of the skull. Dura is normal. Very little blood on the interior of dura. There is a diffuse hemorrhage everywhere in the thin membranes. It is most pronounced, with the thickest layer around medulla oblongata, and pons, extending forward along the membranes, around chiasma and upward bilaterally in the sylvian fossa, decreasing in quantity upwards. The hemorrhage diffuses into the fourth ventricle, farther into the third ventricle and into the lateral ventricles (here distinctly secondary, *i.e.*, having leaked down from the base). No generative changes of the arteries of basis cerebri are found, but a rupture of a little branch of the basilar artery is detected laterally of pons. Otherwise, nothing particular at the autopsy.

Case IX (Professor Harbitz): A man, aged twenty-five to thirty. On 8/V, 1925, he was found dead on the high road. He is reported to have been very drunk. A fellow had given him a blow with his clinched hand on the right under-jaw, thereby upsetting him so that he knocked his head against a fence, and, subsequently, against the root of a tree. He remained lying without giving any sign of life. Post mortem examination on 11/V, 1925: On the forehead a bloody spot is found, and on the left temple a scouring mark, 1 cm. long. There is no fracture of the skull. Considerable and extensive infiltration in the thin membranes, most pronounced at the basis. No degenerative changes in the vessels. The brain tissue normal. There is blood in all the cavities, most in the fourth ventricle. Otherwise nothing particular at the autopsy.

The material at hand, thus, comprises 9 cases of subarachnoid hemorrhage, without lesions of either skull or brain tissue, and without any other detectable morbid states which might have caused death.

These cases include individuals of very different age, ranging from sixty-two to fourteen years, the preponderance, however, being decidedly in favor of the younger age. This accords with the statements made by other authors. Ehrenberg, for instance, has 19 cases below and 12 cases above the age of forty.

As to sex, there were 7 men and 2 women.

With respect to the starting-point of the hemorrhage the material contains the following data: Only in one case (VIII) was it possible to detect the starting-point, *i.e.,* rupture of an ohterwise quite healthy looking artery branch from a basilaris, laterally of pons. In two cases (II and VII) were found arteriosclerotic changes of the vessels, while, in the other cases of this category, where the ruptures in the vessels were not verified the vessels were quite normal. In none of the cases has syphilis played any rôle, nor kidney diseases with increase of blood pressure, either. As to alcohol being a predisposing factor, it is a striking feature that 4 of the deceased had been distinctly inebriated, or, at least, under the influence of alcohol. One should, of course, be very careful in deriving conclusions with regard to the rôle which alcohol plays in such cases; it is very likely that the increase in blood pressure due to alcohol is an essentially corroborating factor, but, perhaps, the alcohol has only been instrumental in creating the situation (fight, quarrel) in which the individuals were exposed to meet with traumatisms.

As to the anatomical localization of the hemorrhage, this has in 8 of the cases been typical symmetric localization to basis, and the hemorrhage has generally been very abundant; in the two following cases examined (V and VI), there was also plenty of blood in the spinal canal. In one of the cases (V), the hemorrhage has a more atypical site, namely on the external side of the parietal lobe.

Finally, we shall discuss that question which is of special interest to the medico-legal authority, *i.e.,* which factor is responsible for the hemorrhage. The problem presents itself as follows:

In *case I* it is undoubtedly a question of purely spontaneous hemorrhage.

In *case II* the first impression is also that of a spontaneous hemorrhage, particularly because of the absence of any sign of external lesion, and, because, in this case, any suspicion of traumatism of the head could altogether be dismissed. However, it should be borne in

mind, that even rather severe traumatisms need not leave any marks, and, that an individual, during a spontaneously occurring illness, can fall to the ground and, thereby, incur serious traumatic lesions.

In *case III,* the circumstances associated with the finding of the dead body indicated that he had been in the act of defecation, when the hemorrhage occurred. Here, the defecation seems to have been the blood pressure-increasing factor which has given rise to the hemorrhage.

In *case IV,* the deceased had received a blow on the left jaw with a clinched hand, and had fallen on to a soft pasture-ground. The external lesions found on the head render it most probable that the traumatism has been the cause of death.

In *case V,* the anatomical localization of the hemorrhage is decisive of the traumatic origin of the hemorrhage. A hemorrhage confined in such an asymmetric way to the convexity is not seen in cases of spontaneous hemorrhage.

Cases VI and VII are very difficult to explain in this respect. According to reports from eye-witnesses, the deceased had in both cases received a very light slap on the head. No signs of external injury are detectable, and the hemorrhage has an ordinary, symmetrical localization. In these cases, there is actually no objective criterion whatever which permits of drawing a conclusion in one or another direction. One may just as well imagine that the excitement caused by the fight or quarrel has given rise to a spontaneous hemorrhage independent of the blow, especially in the 45-year old man (VII), who exhibited slight arteriosclerotic changes of the vessels. Therefore, in the obductional conclusion, one was compelled to leave this question unanswered, a point of view which, in these two cases, was agreed with by the Medico-legal Council to whom the cases subsequently were submitted, and which caused the prosecution against the persons who had hit the deceased, to be dismissed.

In *case VIII,* the deceased in a state of inebriation had fallen heavily to the ground, while, in *case IX,* the deceased who was also in a state of great intoxication, had received a blow on the head and had then fallen to the ground and knocked his head against the root of a tree. These cases are considered traumatic hemorrhages.

From the above it becomes obvious how difficult it often is for the dissector to obtain really objective ground for solving the problem at hand. A careful comparison must be made between the objective findings and the available data (police report, case report, etc.), as they will prevail upon the medico-legal expert's evidence which, of course, should bear the stamp of extreme circumspection.

Further, it is observed that the hemorrhage has been the cause of sudden death in all the nine cases. In those of my own cases, where there was an opportunity of observing the course of the disease, there have not even been spasmodic fits. There at once occurred deep coma which rapidly led to death. In these cases it is difficult to form a positive idea as to the causal agent of such a sudden death. The decisive factor is certainly that we have to deal with an abundant blood extravasation which presses on vital centers of the medulla oblongata, particularly in those cases, where the blood has passed into the fourth ventricle, while the ordinary brain pressure and the commotion presumably are of minor importance.

In cases of subarachnoid hemorrhage the prognostic is not generally described very unfavorably (Froin). In order to form an idea of whether the prognostic of cases, in which subarachnoid hemorrhages are found, is more serious than in other cases of intracranial hemorrhage, I have examined the material of the Institute of medical jurisprudence comprising lesions of the head with death issue. In 21 cases of fracture of the skull with essentially or exclusively subdural hemorrhage, death ensued after 26 hours on an average, while, in 22 cases with predominantly subarachnoid hemorrhage, death ensued after 6 hours. In this comparison of cases, where the other factors (fracture of the skull, contusion of the brain, etc.), are somewhat similar, those complicated with subarachnoid hemorrhage seem decidedly to take the most unfavorable course. A subarachnoid hemorrhage frequently has quite a different aspect: After a spell of unconsciousness of shorter or longer duration the patient awakens, and, now, symptoms resembling meningitis and mental confusion set in. In the ulterior course of the illness there may recur sudden exacerbations (hemorrhages) which may lead to recovery or death. With regard to the diagnosis, the findings after lumbar puncture are decisive; owing to the introduction of the lumbar puncture which, in such cases ought always to be employed, the relative frequency of these cases becomes obvious The importance of the lumbar puncture as a therapeutic measure in cases of hemorrhage is strongly emphasized, among others, by Schrøder (1919), who gives an ample description of the technique of the puncture. The spinal fluid is equally sanguineous in both the first and the last portion and is under an increase of pressure. When the spinal fluid is standing so that the blood sinks to the bottom, or on centrifugalizing, the residual fluid acquires a pale orange tint in cases where the hemorrhage has occurred a few days previously.

Résumé

The isolated subarachnoid hemorrhage can be the cause of sudden death. Nine such cases are on record.

In cases of this type it is often extremely difficult to determine, whether the hemorrhages are spontaneous or of traumatic origin, as the pathologico-anatomical picture in both cases can be perfectly alike, both after rather large injuries and quite small traumatisms.

Very reliable anamnestic data should be demanded, possibly in connection with signs of external lesions, in order to make sure that a traumatism is really responsible for the hemorrhage.

In most cases it is impossible to detect the starting point of the hemorrhage.

As a complication of other cranial or cerebral lesions subarachnoid hemorrhages represent a greatly exacerbating factor.

BIBLIOGRAPHY

1. Balthazard. Précis de médecine légale, 1921.
2. Beadles. Brain. London, 1907, Vol. XXX, p. 285.
3. Brouardel. Mort subite, 1899.
4. Busse. Virchows Archiv, 1922, vol. 222.
5. Ehrenberg. Om spontan Subarachnoidealblødning. Hygeia, 1912, p. 849.
6. Froin. Les hémorrhagies sousarachnoidiennes. Thèse de Paris, 1904.
7. Harbitz. Lærebok i Retsmedicin, 1918.
8. Harbitz. Traumatiske Hjerneaffektioner. Norsk Magasin for Lægevidenskab, 12, 1918.
9. Hedrén. Forlössningstraumatiske intrakranielle Blödninger hos nyfödte och deras rättsmedicinske betydelse. Stockholm, 1918.
10. Hoffmann-Haberda. Lehrbuch der gerichtlichen Medizin, 1919.
11. Kalisko. Plötzliche Todesfälle. Dittrichs Handbuch der ärztlichen sachverständigen Tätigkeit.
12. Møller, Harald. Bibl. f. Læger, 1920, p. 73.
13. Møller, Poul. Om Aneurisma carotidis intracraniale. Hospitalstidende, 1921, p. 305.
14. Petersen, Thorvald. Hospitalstidende, 1921, p. 721.
15. Sand, Knud. U. f. Læger, nr. 6, 1926.
16. Schmidtmann. Handbuch der gerichtlichen Medizin. 1907.
17. Schrøder. Om Hæmorrhagia meningealis og den diagnostiske Betydning af Blod i Spinalvæsken. Bibl. f. Læger. 1919, p. 319.
18. Symonds, C. P. Spontaneous subarachnoid hæmorrhage. Quarterly journal of Medicine, Vol. 18, Nr. 69, Oct., 1924.
19. Vaques and Esmein. Gazette des Hôpitaux, p. 1913, 1906.
20. Vibert. Précis de médecine légale. 1921.

AN INTRODUCTORY STUDY OF THE EROTIC BEHAVIOR OF IDIOTS * †

By Howard W. Potter, M.D.

CLINICAL DIRECTOR, LETCHWORTH VILLAGE, THEILLS, N. Y.

Discussion of Methodology

The initial plan was to study the erotic behavior in long section and cross section of mental defectives of all grades of intelligence by anamnestic methods applied to the family as well as the patient and by personal observation of the patient during institutional residence. The data on erotic behavior so obtained were to be correlated with physical condition and development through endocrinologic, neurologic, anthropometric and biochemical studies and also related to emotional attitudes and reactions through personality and psychiatric evaluations. After attempting this rather large program, it had to be given up mainly on account of insufficient personnel. Nevertheless this attempt demonstrated the tremendous difficulties in securing real facts about the erotic behavior of those feebleminded individuals above the idiot level.

We found that the information regarding erotic behavior obtained by the field worker from the families was sterile or of little authenticity. In fact we are forced to state that scientifically it is useless to expect to be enabled to study directly the erotic behavior of the high grade feebleminded either as to its life history in the individual or as to its manifestations in the family stock. Memory, upon which anamnestic material depends, is too inaccurate as to objective details and too subjective to emotional attitudes and beliefs. And again the inability of the high grade defective to stick to the truth and his inability to be frank about his erotic experiences, images and desires cuts off the method of approach utilized by investigators in collecting similar data on college trained individuals. Therefore the psychosexual development of the high grade feebleminded will have to be determind by inference by collecting data relating to the erotic behavior of groups of these individuals at different age periods and varying mental levels. The basis for such

* Letchworth Village Publication No. 18.

† Financed in part by the Committee for Research on Sex Problems of the National Research Council.

a method is suggested by the procedure used in this study. How well one may succeed in gathering data in a purely objective way on the higher grade defective is also a question. These individuals have a sufficient level of intelligence to cover up their erotic behavior while under the observation customarily afforded by an institution. Even when such data have been secured on the high grade imbecile or moron group, that part of it relating to homosexual behavior must be viewed with the complete understanding that heterosexual impulses are frustrated by the restrictions of institutional life in that institutional life offers no opportunity for heterosexual contacts. The homosexual behavior may therefore be of environmental origin and a substitutive outlet rather than an inherent inversion of the eroticism.

The decision to confine our efforts to a cross section study of the erotic behavior of a large group of idiots seemed advisable because such types seemed to be comparatively free from difficulties met with in studying those of a higher level of intelligence. Feelings of guilt or shame, in the idiot, if present at all, are but weakly developed and are not sufficient to prompt a desire to cover up or repress erotic desires; in fact, desires of any sort. Such desires are open to objectivism therefore and an anamnesis from the patient or the relatives, which from either source experience has shown to be of only fair reliability, is not essential at least for a cross section study. Furthermore, the lack of heterosexual contacts in institutional life would by inference not appear especially to modify the idiots sex drive because long social acquaintance with the idiot extrainstitutionally brings out few or no complaints regarding his heterosexual behavior. We use "his" advisedly because it is conceivable that female idiots may have heterosexual relations through no choice or initiative of their own however. In limiting the scope of the work to the idiot group we still could not carry out the original plan of correlating the erotic behavior data with the physical and mental aspects of the case because even though we had adequate equipment we were entirely too short on personnel.

The Material Studied

This is a report therefore of a study of the erotic behavior of 398 idiots—205 males and 193 females. These patients were studied while living in an institution, being housed in dormitories, sleeping 40 to a ward, the beds being not more than four inches apart laterally. These subjects retire early and arise early. Able-bodied older patients are employed at some sort of rough work and a few of the younger attend an organized hand training class. Weather permit-

ting, the able-bodied group spends most of the day out-of-doors. Many are crippled, some severe enough to be bedridden, some in wheel chairs, and some able to get about on crutches or by crawling on the floor. Many are unable to feed themselves and some do not appear to know how to feed themselves despite the fact they are physically able to do so.

Clinically they present a variety of conditions. Mentally some are alert, others are dull and still others are extremely apathetic. Some are happy and good-natured, others are irritable, quarrelsome, resistive and excitable. Intelligence levels are less than four years by the Terman test with I.Q.s less than 25. Physically there are all sorts of defects, deformities, palsies, paralyses, etc., due to central nervous system lesions or developmental anomalies. Many have gross endocrine dysfunctions of a polyglandular nature. A few are cretins and mongolians. In actual age they range from six to forty, the majority being in the second decade of life.

Presentation of Data

As we have limited this study to the idiot group we have made no effort to further subdivide our material with reference to mental level. In fact it is problematical as to how accurate an estimate of the mental level below 3 or 4 years can be obtained by the Terman or Kuhlman tests. In this study we present our findings only with reference to genital and physical maturity—pre-adolescence, adolescence and post-adolescence.

As the problem was approached, three questions arose, viz.:

1. Are there erotic desires in the idiot and if so, how general are they?
2. If there is erotic desire in the idiot, what is the sex object?
3. If there is erotic desire in the idiot by what sort of behavior is it expressed?

The Presence or Absence of Erotic Desire

Patients who were given to masturbation, mutual masturbation, masochistic or sadistic episodes, stereotyped rocking motions, habits characterized by sucking almost constantly some object or part of the body, and perversions of various sorts such as pederasty, cunnilingus or fellatio were deemed as displaying desire and were consequently regarded as erotic. Those who displayed none of these behaviors were regarded as nonerotic. It may be necessary in order to justify the inclusion of certain of these activities under the term

of erotic behavior to point out that the so-called nongenital behaviors occurred in the majority of instances in the same patient and were indulged in synchronously with purely genital practices (Table IV). This postulates the assumption that the roots of such vicarious behaviors tap the sex impulse or libido.

Nearly three quarters of the whole group were erotic (Table I). Eroticism was present in a larger percentage of the females than the males (Table I). Eroticism was more prevalent in the adolescent

Table I. Showing the Prevalence of Erotic Behavior

	Males		Females		Total	
	Erotic	Nonerotic	Erotic	Nonerotic	Erotic	Nonerotic
	%	%	%	%	%	%
Preadolescents..	35 or 59	24 or 41	42 or 87	6 or 13	77 or 72	30 or 28
Adolescents . . .	41 or 67	20 or 33	51 or 82	11 or 18	92 or 75	31 or 25
Postadolescents.	51 or 60	34 or 40	61 or 73	22 or 27	112 or 67	56 or 33
Total	127 or 62	78 or 38	154 or 80	39 or 20	281 or 71	117 or 29

male group than in either the pre- or post-adolescent group while the females showed eroticism to be present in a larger proportion of the pre-adolescent group with a gradual reduction in the adolescent and post-adolescent groups (Table I). At all periods of life the females exceeded the males in their proportion of erotic individuals.

The Sex Object

The choice of the sex object so far as the limitations of this study are concerned, rests between the subject him or herself or another subject of the same sex. The possible disadvantage of this limitation of choice of sex object has been discussed previously in this paper.

In four-fifths of the total number of 281 erotic subjects the erotic impulse was directed to the self. In the remainder there was in addition an indication that the erotic impulse was directed to other subjects of the same sex. In only three instances was the sex drive directed to their associates only and then in the form of sadistic behavior (Table II). Autoeroticism alone was more common among the females while autoeroticism accompanied by eroticism directed to others was more common among the males (Table II). In each sex autoeroticism alone was more common in the pre-adolescent and adolescent periods while autoeroticism together with eroticism directed to associates was more common in the post-adolescent group.

TABLE II. SHOWING NATURE OF THE SEX OBJECT *

	MALES		FEMALES		TOTAL	
	Sex object self only	Sex object self and others	Sex object self only	Sex object self and others	Sex object self only	Sex object self and others
	%	%	%	%	%	%
Preadolescents.	27 or 77	7 or 20	36 or 86	6 or 14	63 or 83	13 or 17
Adolescents....	35 or 85	6 or 15	44 or 86	7 or 14	79 or 86	13 or 14
Postadolescents	35 or 68	15 or 30	46 or 75	14 or 23	81 or 74	29 or 26
Total†	97 or 76	28 or 22	126 or 82	27 or 17	223 or 79	55 or 20

* Percentages based on the number of subjects showing erotic desire; not on the total number in the study.

† There were only three subjects in the whole group of 281 erotic persons who exhibited behavior indicating that the sex object was another person only. This number being so small is not included in the calculations of this table.

MODE OF EXPRESSION OF THE EROTIC DESIRE

Several modes of expression of the sex desire were noted as follows:

Masturbation. Commonly observed in an infantile form. In but exceptional instances the act consisted of rubbing, scratching, or squeezing the genitalia which did not apparently result in an orgasm. In other words, we observed what seemed to be an abortive form of masturbation.

Masturbation in the form noted above was first in frequency of the different modes of expressing an erotic desire by either sex of the 281 erotic idiots. The proportion of masturbation was greater in the adolescent and post-adolescent males than in the pre-adolescent males and greater in the adolescent females than in the pre- or post-adolescent females. It was found in about equal proportion in each sex (Table II and IV).

Rocking motions. Probably a form of extragenital erotism produced by the rhythmic movements of muscles and joints. These were frequently accompanied by a sort of stereotyped slapping or biting some part of the body or diligently sucking the lips or the back of the hand or pressing the genitalia. This form of erotic behavior was second in order of frequency in either sex. It was more common in the adolescents than in the pre- or post-adolescents of either sex (Table III and IV).

Sucking. This is a form of extragenital stimulation known usually as oral eroticism. It was observed as a diligent sucking of the tongue, lips, fingers, backs of the hands, and occasionally some foreign object, the individual apparently deriving some sort of a real satisfaction from it. It often accompanied masturbation, rocking, and masochism. It was the third most frequent erotic activity practised by either sex and was much more common among the

females than the males. Pre-adolescents and adolescents of either sex were habituated to this activity more than post-adolescents (Tables III and IV).

Masochism. Noted as self-mutilation. The biting was often severe enough to draw blood and the striking sufficiently vigorous to cause a bruising of the tissues. It was carried out in either a rhythmic stereotyped fashion frequently in conjunction with masturbation, rocking, or sucking or occurred during the course of emotional outbreak or tantrum. It was fourth in line of frequency for the whole group and the females, but fifth in order of frequency for the males. In other words it was more frequently observed among the females than the males. Among both sexes it was more common in the preadolescents and adolescents than the post-adolescents (Tables III and IV).

Sadism. Observed as a definite tendency to cruelty toward associates. Such individuals would bite, pinch, kick or strike their associates often without a display of any temper manifestations. Sadism occurred fifth in order of frequency for the whole group and the female group, and sixth in line of frequency in the male group. It was therefore more common among the females than the males. Among the males it occurred in about an equal proportion of the pre-adolescents, adolescents, and post-adolescents and among the females it was more common in the post-adolescents (Tables III and IV).

Mutual masturbation. The act was quite infantile or abortive. It consisted of handling, squeezing, or rubbing the genitalia of another subject and was rarely productive of an orgasm. It was sixth in order of frequency for the whole group and the female group, and fourth in the male group, being therefore more common in male idiots than in female idiots. It was more common in the post-adolescents or pre-adolescents (Tables III and IV).

Pederasty. Seventh in order of frequency. In each instance it was passive, the idiot being the subject, apparently willingly, of some higher grade imbecile or moron. It was seen in only the post-adolescents. There were only eight cases (Tables III and IV).

Cunnilingus. Eighth in order of frequency and the subject in each instance was the aggressor. It occurred among three post-adolescents only (Tables III and IV).

Anal eroticism. Again in a very primitive form, difficult to determine by observation, usually practiced while on the toilet by inserting the finger in the rectum. It was not observed among the females (faulty technic?); was ninth in order of frequency and

TABLE III. SHOWING MODES OF EXPRESSION OF THE EROTICISM

	MALES								FEMALES								TOTAL							
	Pre.		Adol.		Post.		Tot.		Pre.		Adol.		Post.		Tot.		Pre.		Adol.		Post.		Tot.	
Total erotic	59		61		85		127		48		51		83		154		107		112		168		281	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Masturbation only	10	17	8	13	16	19	34	27	9	56	8	16	10	12	27	18	19	18	16	14	26	15	61	21
Masturbation combined	15	25	24	38	23	28	62	49	16	33	30	60	35	42	81	53	31	29	54	48	58	35	143	50
Maturbation total	25	35	32	51	39	47	96	75	25	51	38	76	45	54	108	70	50	47	70	62	84	50	204	73
Rocking only	1	2	5	8	6	7	12	9	5	10	5	10	5	6	15	10	6	5	10	9	11	7	27	9
Rocking combined	7	12	18	29	8	9	33	26	17	35	26	50	31	37	74	48	24	12	44	40	39	23	107	37
Rocking total	8	13	23	37	14	17	45	35	22	45	31	61	36	43	89	58	30	28	54	48	50	30	134	48
Sucking only	5	8	2	3	2	2	9	7	3	6	3	6	4	5	10	6	8	7	5	4	6	4	19	7
Sucking combined	4	7	9	14	6	7	19	15	15	31	18	36	22	26	55	36	19	18	27	24	28	16	74	26
Sucking total	9	15	11	17	8	9	28	22	18	37	21	42	26	31	65	41	27	15	32	28	34	20	93	33
Masochism only	1	2	2	3	2	2	5	4	0	0	0	0	0	0	0	0	1	−1	2	2	2	1	5	2
Masochism combined	4	7	3	4	2	2	9	7	7	14	7	14	9	10	23	15	11	10	10	9	11	7	32	11
Masochism total	5	8	5	8	4	5	14	11	7	14	7	14	9	10	23	15	12	11	12	10	13	8	37	13
Sadism only	1	2	0	0	1	1	2	2	0	0	0	0	1	1	1	−1	1	−1	0	0	2	1	3	1
Sadism combined	2	3	3	4	3	4	8	6	6	12	3	6	10	12	19	12	8	7	6	5	13	8	27	9
Sadism total	3	5	3	4	4	5	10	8	6	12	3	6	11	13	20	11	9	8	6	5	15	9	30	11
Mutual masturbation	5	8	2	3	13	15	20	16	0	0	4	8	6	7	10	6	5	4	6	5	19	11	30	11
Pederasty	0	0	0	0	8	9	8	7	0	0	0	0	0	0	0	0	0	0	0	0	8	5	8	3
Cunnilingus	0	0	0	0	0	0	0	0	0	0	1	2	2	3	3	−2	0	0	1	−1	2	1	3	1
Anal eroticism	0	0	1	2	2	3	3	2	0	0	0	0	0	0	0	0	0	0	1	−1	2	1	3	1
Fellatio	0	0	1	2	0	0	1	−1	0	0	0	0	0	0	0	0	0	0	1	−1	0	0	1	−1

TABLE IV. SHOWING THE VARIOUS COMBINATIONS OF THE MODES OF EXPRESSING THE EROTICISM

	Male	Female	Total
1. Masturbation	34	27	61
2. Masturbation, rocking	16	23	39
3. Masturbation, sucking	9	12	21
4. Masturbation, anal eroticism	1	0	1
5. Masturbation, rocking, sucking	5	15	20
6. Masturbation, anal eroticism, sucking	1	0	1
7. Masturbation, masochism	3	0	3
8. Masturbation, rocking, masochism	1	5	6
9. Masturbation, anal eroticism, sucking, rocking	1	0	1
10. Masturbation, masochism, rocking, sucking	0	4	4
11. Masturbation, mutual masturbation	8	4	12
12. Masturbation, mutual masturbation, rocking, sucking	2	2	4
13. Masturbation, mutual masturbation, sucking	1	0	1
14. Masturbation, mutual masturbation, rocking, pederasty	1	0	1
15. Masturbation, mutual masturbation, pederasty	6	0	6
16. Masturbation, mutual masturbation, rocking, sadism	1	0	1
17. Masturbation, mutual masturbation, rocking	0	1	1
18. Masturbation, mutual masturbation, pederasty, rocking, masochism	1	0	1
19. Masturbation, mutual masturbation, sucking, rocking, cunnilingus	0	1	1
20. Masturbation, mutual masturbation, sucking, rocking, sadism, cunnilingus	0	1	1
21. Masturbation, mutual masturbation, sucking, rocking, sadism, masochism, cunnilingus	0	1	1
22. Masturbation, rocking, fellatio	1	0	1
23. Masturbation, sadism	2	2	4
24. Masturbation, rocking, sadism	1	0	1
25. Masturbation, rocking, masochism, sadism	1	2	3
26. Masturbation, masochism, sadism	0	2	2
27. Masturbation, sucking, masochism, sadism	0	2	2
28. Masturbation, sucking, sadism	0	2	2
29. Masturbation, sucking, rocking, sadism	0	1	1
30. Masturbation, sucking, rocking, masochism, sadism	0	1	1
31. Sucking	9	10	19
32. Masochism	5	0	5
33. Rocking	12	15	27
34. Sucking, rocking	0	13	13
35. Rocking, masochism	0	2	2
36. Masochism, sadism	1	3	4
37. Rocking, masochism, sadism	2	1	3
38. Rocking, sadism	0	1	1
39. Sadism	2	1	3
40. None	78	39	117
Total	205	193	398

occurred in one adolescent and two post-adolescent males (Tables III and IV).

Fellatio. There was only one instance—an aggressor and an adolescent (Tables III and IV).

Summary

A cross section study by objective methods of the erotic behavior of 398 idiots of both sexes made while the subjects were patients in a large institution for mental defectives. The prevalence of a sex desire, its sexual object and its mode of expression were determined and correlated with the sex and physical maturity of the individual.

Nearly three-quarters of the entire group showed the presence of erotic desires, a larger percentage of females than males, and in general it was present in a larger proportion of the adolescents than the pre- or post-adolescents (Table I).

Nearly four-fifths of the total erotic idiots were autoerotic only; they showed no sex drive directed outside the sphere of their own body. The remainder, in addition to being autoerotic directed their sex interests to their associates (of the same sex) as well. There seemed to be a tendency for the males to be rather more extroverted in their sex behavior than the females and the post-adolescents of both sexes displayed more extroversion (Table II) than either the adolescents or preadolescents.

The erotic desire was expressed in forms of genital and pregenital eroticism and perverted eroticism such as masturbation, mutual masturbation, rocking motions, sadomasochism, oral and anal eroticism, pederasty, cunnilingus and fellatio. These occurred as sole behaviors or in combinations of two or more (Table IV). The order of frequency of these forms of sex behavior for each sex is as follows:

Males	*Females*
1. Masturbation	1. Masturbation
2. Rocking motions	2. Rocking motions
3. Oral eroticism	3. Oral eroticism
4. Mutual masturbation	4. Masochism
5. Masochism	5. Sadism
6. Sadism	6. Mutual masturbation
7. Pederasty	7. Cunnilingus
8. Anal eroticism	
9. Fellatio	

In general masochism was more common among pre-adolescents; masturbation, rocking motions, oral eroticism and fellatio among adolescents; and sadism, mutual masturbation, pederasty, cunnilingus and anal eroticism among post-adolescents. In fact there were only eight cases of pederasty (all passive), three of cunnilingus (all

active), each among post-adolescents and only one case of fellatio (active) which was in an adolescent (Table III).

Masturbation and mutual masturbation was more common among the males, while rocking, oral eroticism, masochism and sadism was more common among the females.

Comment

This study, incomplete as it is, points to some very definite relationship between intelligence and sex behavior. These idiots do not present a sexuality any more organized than their primitive intelligence. We may well ask ourselves, Is their infantile sexuality fixed by their primitive intelligence or is their intelligence, in some instances, primitive on account of an infantile fixation of their sexuality or are both dependent on something more fundamental? Let us discuss these various hypothetical relationships.

First as to their sexuality being fixed by their primitively developed intelligence. L. Pierce Clark in a recent communication, "A Psychological Study of the Nature of the Idiot," suggests the idea that the severe limitations placed on the idiot by his damaged intelligence (defects of organic brain disease) frustrates objectivation of his libido, as a result of which he is forced to become an introvert and indulge his satisfactions in narcissistic activities. Such a hypothesis would explain the domination of infantile or narcissistic erotic behavior of the idiots in this study. We must also not leave out of consideration the unknown effect which normally developing intelligence and the stimuli which are gathered from the environment by an adequate intelligence may have on psychosexual development. This immediately suggests a field for more adequate evaluation of the intelligence of persons suffering from transference and narcissistic neuroses or cycloid and schizoid psychoses which would be of value in determining if psychosexual development does depend for at least a part of its normality on the type of intellectual equipment.

Now as to the second question, "Does the infantile fixation of the psychosexual life result sometimes in also a fixation of the intelligence at a low level of development?" When an adolescent develops dementia precox and there is in evidence definite narcissistic modes of behavior, he seems to become, with a rapid deterioration, intellectually blocked. We do not diagnose him as mentally deficient however, because we have another and more appropriate diagnostic category to fit him into. Furthermore, we find in certain idiots those stereotyped movements, grimacings, gestures, etc., commonly observed in some of the chronic psychoses, notably dementia precox.

The reference is to those forms of motor stereotypy associated with reversion rather than hallucinatory reaction types of behavior. We offer merely as a suggestion therefore that in certain instances, there may be such an overwhelming narcissism in the infant as to prevent the outflow and onflow of that portion of the libido which perhaps furnishes at least a part of the urge needed for the development of intelligence and as a result the intelligence becomes fixed at an idiotic level of development. More widespread necropsies and pathohistological studies of the brains of apparently nonorganic idiots would go a great ways in clearing up this question.

Now the last question, "Are both the intellectual deficiency and the psychosexual fixation dependent on a more fundamental situation?" This question immediately suggests carrying out what had been intended in this study, the relation of physical, emotional, and biochemical states to the sex behavior and intelligence level.

In this whole subject, whichever way we may look at it, we see illustrated the biological law of survival of the fittest. No matter how these individuals arrived at their biological unfitness, the lack of adequate procreational urge seems to have been specifically and purposely provided in order to insure the dying out of the stock.

Society Proceedings

BOSTON SOCIETY OF PSYCHIATRY AND NEUROLOGY

Regular Meeting, Thursday, November 18, 1926. Donald Gregg, M.D., President, in the Chair

MUCINOID DEGENERATION OF THE OLIGODENDROGLIA

Percival Bailey, M.D., and Georg Schaltenbrand, M.D.

During the routine pathological examination of the brain from a case of Schilder's encephalitis periaxialis diffusa, the authors have been able to prove that the acute swelling of the oligodendroglia as described by Penfield and the mucinoid degeneration of Greenfield are identical. The article will be published *in extenso* later.

Discussion: Dr. E. W. Taylor: I should like to ask whether mucoid degeneration occurs in any other form of cell.

Dr. Bailey: No. We have examined our material very carefully and have not seen it in any other cell. It is purely a process which affects the oligodendroglia.

Dr. Donald Gregg: What is the diseased condition?

Dr. Bailey: Encephalitis periaxialis diffusa of Schilder. Dr. Greenfield has examined many normal brains for this type of lesion and has not found it. The work of Greenfield has not been generally accepted. Different people have tried to repeat it and have rather cast doubts on the validity of his conclusions. When we first tried on this brain we did not get anything. We found that in order to get good staining we were obliged to refix the tissue in corrosive sublimate. I think that very probably explains the failure of other people to get results.

Dr. D. J. MacPherson: Dr. Myrtelle Canavan of the Psychopathic Hospital found a very similar type of degeneration in the mid-brain of an individual dying of encephalitis lethargica. She was very much intrigued by the lesion and asked for a diagnosis from several different laboratories, but she found no one at that time who would express a definite opinion as to the nature of the degeneration.

Dr. Bailey: It is interesting to me because it is exactly where you would expect to find the degeneration, since the oligodendroglia lie mainly in the white matter of the brain.

THERAPY IN PARALYSIS AGITANS

MAXWELL E. MACDONALD, M.D.

A series of cases showing Parkinson's syndrome was selected for a comparative study with various methods of therapy. Several methods of therapy, for which symptomatic results have been claimed, were tried:

a. Drug therapy:
   1. Parathormone
   2. Bulbocapnin
   3. Sodium salicylate
   4. Hyocin hydrobromide

b. Physiotherapy:
   1. Passive—massage and heat
   2. Active—conscious reëducation

A careful physical and neurological examination was first made. The laboratory work included blood Wassermann, blood calcium, blood CO_2 (in a few cases). In some of the cases spinal fluid examination was made, which included pressure readings, cell count, globulin, Wassermann, gold sol, total protein, calcium. A few of the cases had electromyograms.

The neurological examination seemed to divide the groups clinically into those with a history of encephalitis, showing as the predominating sign rigidity with but relatively little tremor, and the so-called idiopathic group, which showed tremor to a much greater extent. Most of the cases showed pyramidal as well as extrapyramidal signs. Two cases showing no clinical evidence of tremor did show on electromyographic studies a beginning of a periodic excitation. Within the time of the series one of these developed a tremor which could be noticed.

Parathormone (Collip's parathyroid extract): Reports have been made of symptomatic improvement following the use of parathyroid. We decided to use Collip's preparation because of its definite action in increasing the blood calcium. The blood calcium figures in untreated cases fell well within normal limits. Parathormone was given, subcutaneously, in from 10 to 20 unit doses, with an average increase of blood calcium of $33\ 1/3$ per cent. In one case an increase of 75 per cent resulted. An attempt was made to vary the hydrogen in concentration by giving ammonium chloride. In these cases a daily blood carbon dioxide was done. It is interesting to note that the blood calcium curve followed in an increase ratio to the CO_2 curve. In other words, the calcium figure was highest at the height of the acidosis. There was no obvious clinical improvement in any of the cases in which parathyroid was used.

Bulbocapnin: The use of this alkaloid in various tremors was described by de Jong and Schaltenbrand in 1924. We used it in 0.1 gram to 0.2 gram doses subcutaneously. Our experience would lead us to make the statement that it is not effective in paralysis agitans following epidemic encephalitis and only in a part of the cases of the

other group. In a few cases of very severe tremor it worked in a splendid manner, stopping the tremor in a few minutes and lasting several hours. The field for its use seems to be sharply drawn.

Sodium Salicylate: The intravenous use of sodium salicylate followed from the optimistic reports of the Paris clinics. We have not done enough with this to draw any definite conclusions but certainly in a few cases of the chronic encephalitic type there was a distinct relief of symptoms. There was a diminution of the tremor which was noticeable, and a subjective relief of the rigidity. We used 50 c.c. of a 4 per cent solution three times a week. This is worth further trial.

Physiotherapy: We found that while passive methods of physiotherapy gave some immediate relief, there were no lasting results. We came to the conclusion that it was not worth a great expenditure of time. On the other hand, I feel that a conscious attempt on the part of the patient to do a series of graded exercises, for the correction of posture, leads to distinctly beneficial results. This seems rather surprising in view of the extreme rigidity in some cases, but it is a valuable adjunct to any treatment.

Hyoscin Hydrobromide: This still remains the most satisfactory drug for routine use. Given in 1/200 to 1/100 grain doses, one to several times daily, most of the cases were relieved to some extent.

Clinical trials were made of parathyroid therapy, with laboratory control of blood calcium level in a series of cases of paralysis agitans with negative results. Bulbocapnin was very effective in stopping the tremor in a limited number of cases. Sodium salicylate intravenously gave relief of tremor and rigidity in some of the chronic encephalitic cases. Hyocin hydrobromide gave some relief in most of the cases. Physiotherapy was effective only as voluntary controlled effort.

It seems to me that inasmuch as clinical and pathological evidence point to a progressive disease in the paralysis agitans following encephalitis, we should call this chronic encephalitis instead of post-encephalitis. Our efforts towards effective therapy should be directed to the discovery of the cause of the infection and the development of specific therapy. As about 90 per cent of the cases in our clinic at this time are of this type, it obviously stands out as the most important group for therapy. In addition to this numerical preponderance is the fact that many of the cases are young people.

Discussion: Dr. E. W. Taylor: I was particularly interested in what Dr. Macdonald said about the use of hyoscin and in the action of its closely related drug which he did not mention. I want to ask if he makes any distinction between hyoscin hydrobromid and scopolamin hydrobromid. Certainly these are put out as separate preparations, and I have been under the impression that their action is probably a little different. Personally, I use scopolamin exclusively, and my results have been quite different from those Dr. Macdonald mentions. He says, so far as hyoscin has been useful at all, it has been helpful in stopping tremor. I have found it extremely useful in controlling rigidity and not so useful in cases of tremor. I

recall one case of parkinsonian syndrome following encephalitis of the most severe type. The man was a car driver; he was completely helpless, drooling, unable to feed himself, slovenly, not able to get about; apparently in a very low state. I gave him a large dose, 1/100 grains three times a day, and in about a week or ten days he came in alone to see me at my office, well dressed and entirely capable of getting about and taking care of himself in every respect. The improvement, however, was by no means complete, and he has remained in a state of partial disability. The primary improvement was little short of miraculous. I have used scopolamin regularly, and I almost invariably meet with favorable results. I have seen practically no effect upon the tremor.

Dr. D. J. MacPherson: I had one patient with marked muscular rigidity and moderate tremor. He could not shave himself and could not walk. He was given hyoscin with complete release from rigidity but his tremor remained exactly as before. After three months hyoscin lost its effect. He was given scopolamin and the rigidity again disappeared. Scopolamin, too, lost its effect, and he was put back on hyoscin, which again relieved the rigidity. He has since shifted from one to the other. It would seem from this experience that there is some slight physiological difference in the effect of the two drugs. I would agree with Dr. Taylor that in most cases the rigidity can be diminished, but I have seen only slight change in the tremor. In one case, small doses of strychnine seemed to stop the tremor to some extent.

Dr. T. J. Putnam: I have no first-hand knowledge of bulbocapnin, but Dr. Schaltenbrand asked me to show some of his lantern slides. I saw some of the patients with whom he was working in Amsterdam. They studied only cases of idiopathic senile agitans and did not have the opportunity to try the drug on any cases of post-encephalitic agitans. Not all cases responded favorably to the drug. Some were quite unaffected by it. In some of these hyoscin and scopolamin seemed to have some effect, and in other cases bulbocapnin had an effect in decreasing the tremor where other drugs were useless. In a recent article by Lewy, Dr. Schaldenbrand told me that he reports a number of cases, some of the idiopathic senile paralysis agitans and some of the encephalitic form, and found there was probably never any effect in the post-encephalitic cases with bulbocapnin. Other articles have appeared reporting a much larger number of senile agitans, and about one-third of his cases were unaffected by the drug. It was the impression of Dr. Schaltenbrand and Dr. de Jong that the tremor was favorably influenced by bulbocapnin, but that this had no effect on the rigidity; and while it is perfectly true that it would be more preferable to have a truer agent to combat paralysis agitans, in the lack of that we turn to symptomatic measures, and in some cases (probably not a very large proportion) in which the tremor annoys the patient more than the rigidity, or in which the tremor is annoying to the patient in addition to the rigidity, bulbocapnin may find a place. I think there is no doubt its use still remains to be defined.

CLINICAL CONSIDERATION OF SPECIAL TYPES

ABRAHAM MYERSON, M.D.

This is a summary of a study carried on at the Wrentham State School under the direction of Drs. H. B. Elkind and A. Myerson. It was undertaken to see whether or not figures at the Wrentham State Hospital would corroborate or disprove a different type of study carried on at the Walter E. Fernald State School at Waverley. In the earlier study (the one carried on at the Walter E. Fernald School, which has already been reported on before the Society), the statistical analysis was secondary to an intensive individual and clinical study.

(1) There were 1,044 cases at the Wrentham Hospital whose histories were studied. Most of the information, however, concerns smaller numbers. The following appears to be the case concerning these 1,044 inmates: There were 95 per cent white and 5 per cent colored; 42 per cent males and 58 per cent females.

(2) It is evident on a close study of admissions and the causes of admissions that there are more females in Wrentham largely because feeble-minded females seem to get into more social difficulty, or are regarded with more social concern, than are the males. This is evidenced by the fact that the admission age of the females is much higher than the males, and is nearer the age of puberty.

(3) In general, the social level of the families of the group is much lower than that of the general population; many more are from dependent families and institutions.

(4) There are more morons among the females, and the males have more idiots and low imbeciles. The study of the reasons for coming to the institution explains this. Idiots and low imbeciles come in largely because they are more difficult to care for; morons come in because of immorality either in their personal lives or in their background, and for delinquency. Thus it is evident that a social rather than a biological selection takes place. In Massachusetts there are far more agencies concerned with girls than there are those concerned with boys, and this also helps to account for the larger number of females of the moron type and of the adolescent age.

(5) Size of families: This bears on the mooted problem of the prolificity of the feeble-minded. The average family, at Waverley, from which the inmates come is 3.8; the average Wrentham family is 4.5. The Wrentham family is but slightly larger than that of the general population of Massachusetts, but not larger than the cultural level of the group from which the inmates come leads one to expect. It is well known that the higher the cultural level, the lower the birth rate. Independent of the mental status of the families from which these patients come, their lower cultural status explains the slightly increased birth rate. At any rate, no matter how regarded, there is no evidence either in this study or in the study of the late Dr. Walter E. Fernald on the discharged patients from the Waverley institution, to show that the families from which the feeble-minded come have a high birth rate.

(6) Siblings of the feeble-minded:

(a) The statistical analysis of the number of feeble-minded siblings in relation to the size of the family has not been completed, and the figures are too small to be of great value. Among the known cases of the males, the patient was the only member of the family that was feeble-minded in two-thirds of the cases. The figures for females differ but slightly from those of the males. A cursory survey of the figures does not indicate that feeble-mindedness runs nearly so strongly in families as has been alleged. This corroborates our Waverley studies.

(b) Relationship of feeblemindedness to mental diseases: The number of siblings of the patient who have mental diseases is negligible. This, of course, is easily explained on the ground of the age of the siblings who are, in a general way, too young to have recognizable mental disease.

(c) The number of siblings with epilepsy: There are few siblings of the cases with feeblemindedness who have epilepsy; we feel not greater than one would expect in view of the prevalence of epilepsy in the community. It is the experience of every general hospital that epilepsy is very common, probably more common than feeblemindedness or the mental diseases.

(7) The descendants of these feebleminded individuals in Wrentham are too few and, in a general way, too young to show much of importance. We have 57 cases in which we know that there are children. Twenty cases have been followed up, and in only two of these cases was there feeblemindedness. Walter E. Fernald's figures are of interest in relationship to this—646 patients were discharged from the Waverley institution during his incumbency as superintendent; 27 of these people married, there were 50 children, and 33 of these children survived. (This does not indicate a high prolificity of the feebleminded.) His examination of the children of these feebleminded mothers showed them to be nonfeebleminded in every instance.

(8) The study of the parents of the feebleminded:

(a) At Wrentham, this study is associated with great difficulty, and the conclusions have not yet been analyzed, but they indicate as follows: Both parents were apparently normal in 69 per cent of the male patients; both parents were normal in 54 per cent of the female patients. In 10 per cent of both groups, one parent was feebleminded, and in 6 per cent both parents were feebleminded, showing that the feeblemindedness of the parents is a significant factor. There was not enough epilepsy in the parents to be of significance.

(b) In regard to mental diseases, there were 3 cases where both parents were mental, as contrasted with 49 where both parents were feebleminded; there were 35 cases with on parent mental as contrasted with 70 cases where both parents were feebleminded. The study of these 35 mental cases shows a good many conditions which we do not regard, on the basis of a published study of the inheritance of mental diseases (Myerson—"Inheritance of Mental Diseases"), as significant; in other words, they are exogenous rather than endoge-

nous. There were 4 alcoholic psychoses, 5 cases of general paresis, and two cases of toxic psychoses after pregnancy.

It is very significant that of these 35 cases with mental disease, there were 10 cases who were diagnosed in institutions as feebleminded and not insane. Seven finally simmered down to endogenous mental disease; 4 cases of dementia precox, 2 cases of manic-depressive, and one case of cardiorenal vascular disease. Studying these cases, we do not feel that, in the main, mental diseases of the parent can be stated to be of relevance in the history of a person with feeblemindedness.

(9) Relationship of syphilis to feeblemindedness: This study shows 3.5 per cent of the patients had positive Wassermanns. The Solomons, in their study of "Syphilis of the Innocent," showed that reports concerning the incidence of syphilis in the young are very contradictory, but they conclude that about 5 per cent would show a positive Wassermann. Thus the reaction of the population at Wrentham is certainly not more than that of the community. It is a very significant thing that 35 per cent of these were females, morons with a history of irregular sexual life. In other words, the chances are very strong that, at least amongst the females, there was acquired syphilis instead of congenital.

In our Waverley study, we stated our reasons for concluding that syphilis did not play a rôle in feeblemindedness; our Wrentham studies seem to corroborate this. If it plays a rôle, it is that of a minor, unnamed supernumerary, instead of that of star performer. The importance of syphilis in a pathology of feeblemindedness has been distorted by the traditional issues which intrude themselves into science with every reference to sex and morals.

(10) We introduce the concepts of relative feeblemindedness and technical feeblemindedness to account for a good deal of the sporadic cases of feeblemindedness and much of the familial feeblemindedness. In every human quality there is fluctuation up and down, and intelligence is no exception. In a high grade family a fluctuation downward is not as apt to produce a moron as it is to produce an individual lower than his group, that is, a relatively feebleminded person. In the case of a low grade group, above the technical feebleminded level, a fluctuation downward is apt to produce a technically feebleminded person. The term "technically feebleminded person" is used to indicate that the concept of feeblemindedness is not an absolute one, and cannot be scientifically defined or justified.

Discussion: Dr. G. L. Wallace: We are much indebted to Dr. Myerson and his coworkers for the splendid work they are doing. When the pathological groups, the Cretins, Mongolians, Spastics, and a few special groups are separated from the mass, we then view feeblemindedness, as Dr. Myerson outlines it, as a condition and not as a medical disease. It is a pathological disease but social, not medical. I am sure in saying that to a medical audience I am not going to be misunderstood for, primarily, from its origin we must consider it as a medical problem, but the problem as the community meets it, is a pathological social condition. This condition which

is easily classified to-day within the realm of feeblemindedness, ten, fifteen or twenty years ago was not within that realm. A few years ago, before the social order of things became so complex and exacting, many of these people with low mentality and disturbed emotional natures were able to make better adjustments with their environment than they are to-day. And then, when they were out of alignment with their environment, they were not classified as feebleminded but received consideration by the courts and various social organizations and treated in accordance with the symptoms they presented. Dr. Myerson has clarified the problem to a great degree by separating it from mental diseases and from the pathological groups of feeblemindedness. By so doing, he places this problem where it may be viewed as one strata of society. But even so, it is none the less a serious and significant problem. I quite agree with Dr. Myerson that it is not a problem of intelligence that we are dealing with in abnormal behavior in the higher Moron age levels. In our survey a few years ago, of one hundred girls with a mental age of eleven and eleven plus, we found on investigation of the family histories that the member of the family that we were dealing with in each instance was simply a cross section of the family. The reactions of our cases were quite similar to those of their brothers, sisters, fathers, mother, uncles, aunts and grandfathers and grandmothers. We found that the reactions of these families for generations were out of alignment with the social requirements of the communities in which they lived. It seems that there are very potent, positive and powerful biological factors dominating this great problem of the unclassified feebleminded. Since Dr. Myerson has so successfully segregated this large group of unclassified feebleminded, we are now anxiously awaiting the next step which, I hope, will be the breaking up of this group into well defined sections.

Dr. Myerson: It is astonishing how many children are born with blood in the spinal fluid. The work of Sharpe, and of others in Germany, shows that children who are apparently born normally have had either a subarachnoid or an intraventricular hemorrhage, or, at least, blood has found its way into these situations. Blood in the spinal fluid does not, of course, adequately represent damage in the cortical or subcortical areas.

A very interesting series of articles has appeared on the effect of encephalitis upon the mentality of children, showing that mental defect follows in at least a small proportion of cases. A personal follow-up of children who had encephalitis, and who had been treated at the Boston Children's Hospital, showed that mental deficiency was to be expected in some instances. The number of cases was too small to be dogmatic about.

Dr. Elkind's statement that we are dealing with a selected group is true, but the point is that we have selected the worst group from the standpoint of heredity, the public institutional cases, and that groups in the community and public schools would have still less heredity.

In regard to Dr. Wallace's remarks—the most of girls with a mental age of eleven do not get into trouble, but those who do are sent to his institution, or other schools for the feebleminded. There are girls of the same temperament, but with a higher mental age, in the reform schools. We had better invoke heredity as explaining things only when we can prove it—not as a working hypothesis. As a working hypothesis, it kills research into more easily handled causes. Our ignorance of causes has usually paraded as heredity. Witness the history of tuberculosis, goitre, and epilepsy.

Current Literature

I. VEGETATIVE NEUROLOGY.

1. VEGETATIVE NERVOUS SYSTEM.

Lintz, W. Bronchial Asthma Due to Mice. [N. Y. Med. Jl. and Med. Rec., June 20, Vol. CXXIX.]

This is an interesting clinical report in which the removal of a few dead rats from beneath the boards of the bedroom floor of the patient freed her from attacks of bronchial asthma for three years.

Stivelman, B. P. Pleuropulmonary Reflex. [Am. Jl. of Med. Sc., June, Vol. CLXV. J. A. M. A.]

Stivelman reviews his experience gained from pleural punctures in the course of therapeutic pneumothorax. Among 162 primary punctures, pleuropulmonary reflex was encountered in seven patients, in three of whom the attacks recurred on subsequent attempts to enter the pleural space. The most severe and outstanding symptom during the attacks was cardiorespiratory embarrassment. It was present in all. This distressing symptom was of the vagoinhibitory type in three cases and vasomotor in seven cases, the former being characterized by slowing of respiration and decreased frequency and increased force of the pulse, the latter by rapid, shallow and arrest of respiration, and rapid, feeble and ultimately imperceptible pulse and heart beat. Among 1,824 punctures for refills, *i.e.*, thoracentesis performed in those cases in which the pleural surfaces were widely separated from each other by pneumothorax so that the needle could not possibly injure the visceral pleura and underlying lung tissue, the accident occurred but twice. Stivelman believes that injury to the inflamed visceral pleura and lung tissue underlying the point of puncture is a definite factor in the causation of this symptom complex. When symptoms pointing to the reflex make their appearance, the needle should be withdrawn at once. If the cardiorespiratory failure is of the cardioinhibitory type, reassurance of the patient and a little patience on the part of the physician is all that is necessary, although atropin may be given subcutaneously in severe cases, none of which, however, have proved fatal. If the cardiorespiratory failure is of the vasomotor type, epinephrin should be given subcutaneously at once and stimulation should be resorted to. Hot coffee per rectum, caffein and camphor subcutaneously, have been found most useful. The temporary paralysis and

amblyopia, as a rule, clear up completely within a few days and require no special treatment.

Terrien, F. Ocular Disturbances in Respiratory Affections. [Paris Méd., Jan. 27, Vol. LVI. J. A. M. A.]

Terrien reviews the mutual relations of ocular and respiratory disturbances. Even a normal inspiration and expiration is accompanied by a slight dilatation and contraction of the pupil. This is of nervous origin and not due to changes in the blood content of the iris. In pneumonia, herpes of the cornea is comparatively frequent. The defect of the epithelium may be easily discovered by the fluorescein test. Dilatation and subsequent contraction of the pupil on the side of a pneumonia or spinal lesion has been found by Chauffard. Three weeks after pneumonia a paralysis of the ciliary muscle (not of the sphincter of the pupil) similar to a postdiphtheric palsy may occur. Sarcomas of the lung and mediastinum may lead to metastasis in the choroid. On the other hand, affections of the eye may have an influence on the respiratory tract: Compression of the eye retards expiration. Irritation of the cornea may stop spasm of the glottis. Strong light can provoke sneezing in some individuals. This is probably due to an increased flow of tears, which irritates the mucous membrane of the nose.

Martini, A. de. Hemoptysis and Vagosympathetic Tonus. [Riforma Med., Vol. XL, April 14.]

The vegetative nervous system tests, such as oculocardiac reflex, epinephrin, pilocarpin, eserin and atropin were applied by this author in patients with hemoptysis and in the majority signs of vagotonia were present. Atropin was definitely valuable in a number of cases.

Pack, G. T. The Sensation of Thirst. [Amer. J. of Phys., Vol. LXVI, July. Aust. M. J.]

Pack states that the theory that thirst is of the nature of a general sensation, with a secondary local reference to the pharynx, has received widespread and almost universal credence. According to this view the loss of water content of the tissues increases the salt concentration of the body fluids and this condition is responsible for the origin of afferent impulses from the various viscera or for the direct stimulation by the hypertonic blood of the unknown center in which the sensation of thirst is represented. According to Cannon thirst is due to a relative drying of the mucosa of the mouth and pharynx due to either a diminution or absence of the salivary secretion, a condition brought about by any dehydrating factor or by such local factors as mouth breathing, prolonged speaking, et cetera. The thirst produced by physiological doses of atropin, by such emotional states as anxiety and fright, he explains as due to a diminution or absence of the salivary secretion. The author has investigated the subject from the point of view that if an increase in the

flow of saliva will appease the desire to drink, then it might be inferred that pilocarpine would be an efficient agent in relieving thirst. Rabbits were subjected to seven day periods of fasting, food and water both being withheld. At the end of this period pilocarpine hydrochloride was administered subcutaneously. When salivation became profuse, measured amounts of water were placed in their cages and left for an hour. Control animals were given a hypodermic injection of equivalent amounts of water so as to eliminate the psychic factor. The rabbit controls drank sixty-two to one hundred and thirty-seven cubic centimeters within the first half-hour. The rabbits salivating from pilocarpine either refused to drink or, as in two cases, drank fifteen to twenty-five cubic centimeters of water within the hour. The difference can be interpreted as due to quenching of their thirst by drinking their own body fluids. Pilocarpine brings about an exceptionally high blood concentration, especially when its administration is superimposed upon prolonged water deprivation so that thirst cannot be of the nature of a general sensation.

Belgrano, Raul Ortega. Treatment of Vagotonic Vomiting. [Prens. Méd. Arg., March 30, Vol. X.]

Excessive irritability of the vagus center was present in the two cases here reported. One patient with intense headaches and uncontrollable vomiting, with pulse of 52, was relieved immediately by amyl nitrite, its action prolonged with belladonna, and the hypertension was combated with 30 per cent solution of glucose. Uncontrollable vomiting and bradycardia of 40 after excesses were the symptoms in a second patient. Both were syphilitic, but the vomiting was not influenced by specific treatment. It yielded at once to vagus inhibitory drugs.

Holler. Treatment of Chronic Gastric and Duodenal Ulcers. [Med. Klin., March 25, Vol. XIX.]

In two cases of ulcers of the duodenum oblongata changes were found. Parenteral protein treatment was tried, and found that, unlike normal persons, disappearance of hemoclastic crises occurs. Large amounts of alkali are beneficial.

Tscherning, R. Predisposition to Gastric Ulcer. [Arch. f. Verd.-Krank., July, Vol. XXXIII. J. A. M. A.]

Tscherning states that not all gastric ulcers fit into his frame, but it includes the overwhelming majority. The main type is tall, slender, with a blending of asthenic and athletic elements, vasomotor instability and, in a large proportion, endocrine-genital anomalies tending to the eunuchoid type. The persons examined were all men under social insurance, and he tabulates the body measurements by the averages for the group. Decided vagotonia or sympatheticotonia was never observed. There were only two instances of another gastric ulcer in the family.

Löwy, M., and Tezner, O. Atropin, Pilocarpin and Gastric Motor Function. [Mon. f. Kind., Vol. XXVIII, July.]

X-ray examination of gastric motor function in eighty-five children between five and fourteen after subcutaneous injection of atropin or pilocarpin are here reported. Atropin retarded the evacuation of the stomach in every case when 2 mg. was given. In 50 per cent pilocarpin retarded it.

Hatcher, R. A., and Weiss, S. Studies on Vomiting. [Jl. of Phar. and Ex. Ther., Oct., 1923. J. A. M. A.]

Vomiting was induced by Hatcher and Weiss after destruction of the quadrigeminal bodies, the cerebellum and the area described by Thomas as the vomiting center in the cat, and of the latter area in the dog. Vomiting was not induced after destruction of the sensory nuclei of the vagi in cats, nor after destruction of the nucleus of one side in any of six experiments on cats and one experiment on a dog, but it was induced in one such experiment in which the destruction of the nucleus may have been incomplete. The results of experiments indicated that the sensory nuclei of the vagi are essential for vomiting in the higher mammals, however it is induced (possibly with exceptions so rare that they do not enter into this discussion). Hatcher and Weiss feel justified, therefore, in stating that the vomiting center is embraced within the sensory nuclei of the vagi. Twenty-seven substances were used in thirty-five experiments on dogs and cats in which ninety-seven applications were made to the floor of the fourth ventricle just above the obex. Thirteen of the substances induced vomiting in dogs and one drug caused vomiting in cats. The vomiting center is sensitive to the depressant action of apomorphin and other substances, and when moderately depressed in this way it is not stimulated by the application of other substances that commonly increase its excitability, but it is still capable of being excited reflexly from the stomach. The intravenous injection of a relatively small dose of mercuric chlorid induces vomiting, probably reflexly from the heart. The authors were unable to induce vomiting by the local application to the center of pilocarpin, quinin, tartar emetic, veratrin, or any of the digitalis bodies (previously reported), all of which induce vomiting in the eviscerated dog, nor was vomiting caused by the application of cocain, caffein, or atropin, toxic doses of which induce vomiting in the intact animal. These experiments furthermore proved that there is a defecation center in the floor of the fourth ventricle.

Savignac, R. Gastric and Duodenal Ulcer. [Paris Médical, Jan. 12, Vol. LIII.]

In this clinical study two types of pain which appear characteristically after a meal and which are relieved by alkalis are reported. In case of an ulcer in stomach or duodenum, these pains return regularly for four or

five days at least, and then—at first—are followed by a period of relief. In affections other than ulcer (dyspepsia with gallstones, colitis, ptosis, etc.) the periods are either consistently irregular or the pain occurs regularly every day from the beginning of the affection.

Daniélopolu, D., and Carniol. Influence of Sleep on Motility of Stomach. [Arch. d. Mal. d. l'App. Dig., Vol. XIII, March.]

In three patients with stenosis of the pylorus observed by these authors, there was a marked inhibition of movements of the stomach during sleep. The gastric contractions started and increased progressively to the usual strength on awakening.

Timbal, L. Motor Functioning of the Stomach in Neuropaths. [Paris, Méd., Feb. 9, Vol. LIII. J. A. M. A.]

Timbal says that a general neuropathic diathesis, ærophagy, modifications of the normal gastric motility, malaise, griping pains and vomiting after meals, with unpleasant sensation of pressure and tension, are the main features of the disease dealt with. The patients are young, men rather than women, all being neuropaths. Radiologically, the stomach proves to assume a more horizontal position, and its shape resembles somewhat a cow's horn. Localized spasms at the pylorous or cardia are also demonstrable. Careful differentiation from ulcer should be made. Among his thirty-six cases there was only one with hyperchlorhydria and two others with both hypochlorhydria and hypacidity, these latter with positive Wassermann. Causes of the trouble, besides the predisposing factors, are found in traumatism, weakening after other diseases, but especially overexcitability of the vegetative nervous system. Therapy consists in quieting the pneumogastric nerve and the solar plexus with camphor, bromin, opiates, hyoscyamus, cocain or codein; hydrotherapy also is advocated. Syphilitics were given specific medication, after which their gastric anomalies ceased.

2. ENDOCRINOPATHIES.

McCarrison, R. Pathogenesis of Deficiency Disease. No. XI. [Ind. Jl. of Med. Res., July, 1923. J. A. M. A.]

The results reached by McCarrison in the course of his experiments with pigeons may be summarized as follows: Confinement in cages that became grossly contaminated by the animals' own excreta is a potent cause of thyroid hyperplasia and enlargement. It can be prevented by scrupulous cleanliness and to a less extent by the administration of chlorin water. The thyroid hyperplasia under these circumstances is not due to inadequate supply of iodin in the food, but is probably due to the inadequate absorption, assimilation or utilization of iodin consequent on the conditions provided by dirty animal cages; of these conditions gastro-

intestinal infection is considered to be chief. An excess of butter or of oleic acid in the food may, in certain cases, enhance the goiter producing action of insanitary conditions of life, such as are present in dirty animal cages; or, the goiter producing influence exerted by an excess of fats in the food may be enhanced, in certain cases, by such insanitary conditions of life. There is a reason to believe that the effects of fat excess in determining thyroid hyperplasia may be related in some way to bacterial intervention in the digestive tract. Cod liver oil affords complete protection against goiter induced by insanitary conditions of life, such as are present in dirty animal cages. A relation exists between the intake of fats in the food, the amount of available iodin in the food and the functional perfection of the thyroid gland.

Glanzmann, E. Vitamins and Endocrine Glands. [Jahr. f. Kind., Vol. LV, Feb.]

Rats were kept by this experimentor on a vitamin-free diet until the growth stopped. One gm. of dried thymus from calves was then given and the growth again was resumed to cease as soon as the thymus was no longer given. Other glands—except the sexual—have no effect in such doses. The central organ for metabolism of vitamins in young animals is the thymus. Vitamins are stored in the sexual glands and provide thus the first endowment of the progeny after puberty.

Kingsbury, B. F. Endocrine Organs. [Endocrin., Vol. VIII, Jan.]

A general thesis bearing on the complex interrelationships of the endocrines. [Why not the whole body?]

Mouriquand, G., et al. Endocrine Glands and Deficiency Diseases. [Rev. Fr. d'End., Vol. I, May.]

Mouriquand, Michel and Sanyas found that deficiency diseases developed in their ninety-two guinea pigs earlier and more pronounced when they were given thyroid extract. No effect in this line was observed from epinephrin, even when kept up for 240 days.

Schick, B., and Wagner, R. Pluriglandular Atrophy from Deficiency Diet. [Zeits. f. Kind., Vol. XXXVII, June 7. J. A. M. A.]

In this second communication on this subject, Schick and Wagner describe the outcome in their two previously published cases, and report three new instances. Necropsy in two cases confirmed the extreme atrophy of the thymus and thyroid, suprarenals and pancreas, of the tongue, and of the mucosa of the entire intestine. The ductless glands atrophy more and more. Treatment should aim to stimulate and exercise these glands rather than to spare them. One child, aged nine, had been repeatedly underfed in treatment of digestive disturbances, and had been brought to the clinic as a hopeless case of ulcerative enteritis and peritonitis, although tuberculin tests were negative; the stools were of the diarrheic fat and

fermentation type. Under mixed feeding with suitable calory and vitamin content, the child began to thrive at once. In the two fatal cases in infants, there was pronounced exophthalmia, edema and a hemorrhagic tendency. Probably many cases of cachexia and hemorrhages in the past, ascribed to other causes, were in fact deficiency disturbances from lack of vitamins. The tongue was atrophic, smooth and red in their five cases. The condition has been described as "celiac disease," and "digestive disturbances beyond infancy," but the avitaminosis sets up a vicious circle which results in actual starvation.

Clark, A. J. Experimental Basis of Endocrine Therapy. [Br. Med. Jl., July 14, 1923. J. A. M. A.]

The therapeutic action of but a few of the endocrine extracts is established. Polyglandular therapy is still empirical. These shotgun prescriptions usually contain dried thyroid, extract of the posterior lobe of the pituitary, thymus, suprarenals, and extract of testes or ovaries, and are usually given by the mouth. Of these constituents the thyroid is beneficent if the patient chances to be suffering from thyroid deficiency, and in other cases there is usually too little present to do any harm. Pituitary extract is inactive when given by the mouth, except as regards its effect in reducing carbohydrate tolerance in cases of pituitary tumor deficiency; this action would be assisted by the thyroid, but it is difficult to see what benefit it would produce for the patient. Pituitary deficiency, as manifested by Fröhlich's syndrome or by diabetes insipidus, is very rare, and outside these conditions there is no rational indication for the use of pituitary extract, other than its usual use as a temporary stimulant to the uterus, intestine or blood vessels. It is not known whether the thymus even has an internal secretion, nor is it known whether its extracts have any therapeutic action. As regards epinephrin, it is not certain whether it is essential for the normal health of the body. The low blood pressure and asthenia in Addison's disease are not simple results of epinephrin deprivation. Epinephrin, when given by the mouth, may be of benefit in gastric hemorrhage or to relax esophageal spasm, but otherwise there are few actions that it has been shown to exert when given by the mouth. Finally, nothing is known for certain about the action of extracts of the gonads. Clark suggests that the administration of a mixture of the above nature is as far removed from rational therapy as is the writing out of a charm on a piece of paper and giving that to the patient to swallow. He says that the extracts on the market have as high a degree of potency as any that it is possible to produce. This is, of course, an unwarranted assumption, for in the case of those extracts for which a test of activity has been found, and a correct method of extraction discovered, it frequently happens that some slight error in extraction may result in an inactive preparation being produced; this can occur, for example, with insulin and with extract of the posterior lobe of the

pituitary. Obviously, when there is no reliable test for the activity of extracts, it is impossible even to know which is the best method of preparation, and the odds against such preparations having any activity whatever are very heavy.

Eggenberger, H. The Prevention of Goiter and of Its Recurrence. [Schweiz. med. Woch., LIII, 245. Tice.]

The exact amount of iodin secreted by the thyroid gland, and the mechanism of its action are not definitely known. Its great importance in the maintenance of health has, however, been proven. Like other inorganic substances in the body, it probably follows a systematic cycle of excretion and production. However, the extent of this iodin metabolism is yet to be determined. On the basis of the sodium chlorid metabolism, Eggenberger estimates the daily production of iodin by the body to be 0.0001 gram.

The favorable effect of a diet of eggs, green vegetables and seafish in goiter is undoubtedly due to the iodin content of these foods. The fact that goiter is rare in regions in which the air and soil contain an abundance of iodin is well known. The influence of constitution in the production of goiter consists in a decrease in the iodin resorption, and also in the presence of abnormal demand for iodin. Alcoholism, neurasthenia and chronic subfebrile tuberculosis increase the general restlessness, therefore the iodin demand accordingly predisposes to compensatory goiter.

Common salt is the best medium for iodin. An effective prophylactic measure against goiter consists in the consumption of adequate quantities of iodized salt. An overdose of iodin is not possible, as the tolerance for salt is comparatively low.

As the iodin content of salts from various regions differs, the varieties sold for consumption should be tested, and the requisite amount of iodin added if the content is deficient. This precaution will not only serve as a prophylactic measure, but will also prevent recurrences of goiter following strumectomy.

Boothby, W. M. Differential Diagnosis of Thyroid Diseases. [Annals of Surgery, Vol. LXXIX, November.]

Boothby discusses the importance of correct differential diagnosis in surgery of the thyroid gland in particular, as it affects four kinds of thyroid disease, namely, diffuse colloid goiter, adenomatous goiter without hyperthyroidism, adenomatous goiter with hyperthyroidism, and exophthalmic goiter. Among the points which he brings out are the following:

Diffuse colloid goiter is a symmetric enlargement of the thyroid gland, characterized pathologically by an excess of colloid in the acini, and unassociated with symptoms of hyperthyroidism. On palpation the gland feels quite similar to that in typical exophthalmic goiter, and there-

fore, if the enlargement occurs in a nervous unstable person who has symptoms recognized as "effort syndrome" or "disordered action of the heart," a mistaken diagnosis of exophthalmic goiter is readily and unwittingly made. The basal metabolic rate is a great help in distinguishing these cases from exophthalamic goiter, because the rate is not only not persistently elevated in diffuse colloid goiter, but is usually somewhat below normal, while in exophthalmic goiter, with rare exceptions, it is more than 20 per cent above normal. Operation is indicated only if the goiter becomes excessively large and does not respond to medication; such failure of medication indicates that the enlargement may be due to colloid adenomatous tissue, and not to typical diffuse colloid goiter.

Patients with diffuse colloid goiter are safe operative risks; they also get well under medical treatment; therefore, the surgeon, by including the condition in the classification of exophthalmic goiter, will greatly reduce his mortality rate, and similarly the internist will increase the number of patients getting well under medical treatment. At the Mayo Clinic, no patient with diffuse colloid goiter and a normal basal metabolic rate has been operated on during 1922.

Adenomatous goiter masses, as a rule, do not respond completely to thyroid or iodine medication; in fact, iodine is particularly dangerous in cases of long standing of adenomatous goiter without hyperthyroidism, because the iodine is likely to stimulate, or rather aid the adenomatous tissue to hyperfunction.

Operation is indicated for adenomatous goiter without hyperthyroidism for cosmetic reasons, for the relief of pressure symptoms, and as a preventive measure against future hyperthyroidism. In order to estimate the probable risk to the patient, accurate distinction must be made between it and adenomatous goiter with hyperthyroidism. For this purpose the basal metabolic rate is of great help, because if it is within normal limits it excludes hyperthyroidism.

Adenomatous goiter with hyperthyroidism is a constitutional disease due to the presence in the thyroid gland of adenomatous tissue.

From the surgical viewpoint, the fact that the constitutional symptoms are due to the activity of the tumor is very important, because it permits the surgeon to assure the patient, before operation, of almost certain cure, provided the disease has not lasted long enough to produce permanent and irreparable damage of the heart or other organs. The operative risk is, however, much greater than in cases of adenomatous goiter without hyperthyroidism, and may be higher than in cases of exophthalmic goiter.

Exophthalmic goiter is a constitutional disease, apparently due to excessive, probably abnormal, secretion of an enlarged thyroid gland with pathologically diffuse, parenchymatous hypertrophy and hyperplasia. The condition is characterized by an increased basal metabolic rate and the resulting secondary manifestations, by a peculiar nervous syndrome, and,

usually, by exophthalmos with a tendency to gastrointestinal crisis of vomiting and diarrhea. The cause of the altered pathology and disturbed function of the thyroid gland is not known.

In reply to the question: "If both exophthalmic goiter and adenomatous goiter with hyperthyroidism are due to an excess of thyroid secretion, can there be a differentiation into two diseases?" several hypothetical answers are possible, but the one held by Plummer as the most probable is briefly as follows:

The symptoms of adenomatous goiter with hyperthyroidism can be produced by the administration of an excess of thyroid extract or thyroxin; therefore, adenomatous goiter with hyperthyroidism is regarded as due to the presence in the body of an excess of normal thyroid secretion.

The symptoms of exophthalmic goiter, however, cannot in their entirety be produced by thyroid feeding. The symptoms which are not produced in characteristic form are exophthalmos, the typical gastro-intestinal crisis, the peculiar nervous phenomena, and finally the metabolic status, as a result of which a post-operative reaction may arise which terminates in death within about thirty-six hours.

All of these symptoms which are characteristic of exophthalmic goiter can probably be explained on the assumption that the secretion of the thyroid gland is not only present in excess, but that it is also an abnormal product.

II. SENSORI-MOTOR NEUROLOGY.

3. SPINAL CORD.

Rivarola, R., and Obarrio, J. M. Tumor of the Spinal Cord. [Arch. Lat.-Am. d. Ped. July, 1923.]

This patient, a boy of 9 years, had symptoms of compression of the spinal cord from the seventh cervical segment to the first and second dosal segments. The cerebrospinal fluid was yellow, and it coagulated completely. It contained no cells and gave none of the reactions specific to syphilis, but the albumin content reached 1 per cent. A large tumor was found in the cord instead of being, as was expected, outside of the cord.

Schaller, W. F., and Gilman, P. K. Spastic Paraplegia in Flexion. [Am. Arch. of Neuro. and Psych., X, 512.]

A spinal tumor in the anterolateral aspect of the cord presented an unusual feature of flexion paraplegia. A woman, 55 years of age, had pain and stiffness in both lower extremities. The limbs became paralyzed, and she has partial bladder impotency. On examination, there was bilateral atrophy of the dorsal interossei and hypothenar muscles, more marked in the left hand. The patient lay with the thighs flexed on the abdomen forming an angle of about 135 degrees; the legs were flexed

on the thighs at approximately 90 degrees. The lower extremities were pressed together by contraction of the abductors but could be forcibly separated. Slight, if any, active motion was possible in any segment of the extremities owing to the spastic contracture of the flexors and abductors. Pain sensation was disturbed and hot and cold stimuli were confused below the segmental level of the second dorsal root. The spinal fluid was of a striking yellow color, and there was a marked globulin reaction. Laminectomy was done, and a dural endothelioma 4.75 cm. in length was found compressing the anterolateral region of the cord and extending from the middle of the fifth lamina downward to a little beyond the seventh lamina. Four months after removal of the tumor, the patient, who had been fitted with braces, could stand and walk with assistance. Voluntary motion was returning in the left lower extremity, sphincter control was regained and sensation was returning.

No definite conclusions can be drawn as to the mechanism of the flexion paraplegia which occurred in this case. The location, localization and extent of the tumor may one or all have been factors in its production. The fact that slight, if any changes have been observed in the pyramidal tracts in similar cases might suggest that the location of the tumor in front of the dentate ligament may have spared the lateral pyramidal tracts from degeneration, but may have involved the extrapyramidal long fiber tracts, namely the vestibulspinal and tectospinal tracts, which descend in the anterior white matter of the cord between the anterior horn and the periphery.

Fraser, J. Paralysis of Pott's Disease—Operation for Its Relief. [Edin. Med. Jl., Sept., 1923. J. A. M. A.]

The operation devised by Fraser has been undertaken to relieve those cases of paralysis secondary to Pott's disease which have failed to respond to conservative treatment. A thorough trial is given to conservative measures, but, if no success is obtained, the paralysis is becoming more extensive, and there is danger of the cord degenerating, resort is had to operation. The operation entails division of the laminae of the affected vertebrae and of one or two laminae above and below the site of the lesion. Fraser asserts that the operation is invariably followed by early and progressive improvement in the paralysis, and, if care is continually exercised in regard to postoperative rest, recovery is complete and permanent. No weakening of the spine follows the operation. This report is based on the records of four cases, in all of which the operation was successful, though in one instance want of care in postoperative treatment resulted in a temporary relapse. The outstanding advantage of the operation is that it appears to relieve the spinal pressure that is maintaining the long standing paralysis, and which, if unrelieved, may result in spinal cord degeneration.

Sénèque, J. Anomalies of Seventh Cervical Transverse Process and Effects on Brachial Plexus. [J. de chir., XXII, 113–33. Med. Sc.]

It is considered that there is some confusion in the nomenclature of the bony swellings in relation to the seventh cervical vertebra that may cause symptoms by interference with the brachial plexus. Nervous lesions may be produced by enlargements of the transverse processes of the seventh cervical vertebra which are not costal elements. A distinction is drawn between enlargements that definitely belong to the anterior tubercle of the transverse process and those that do not; it is pointed out that the latter kind may be met in association with cervical rib, their coexistence demonstrating their diverse characters. The eighth cervical nerve is stretched over the enlarged transverse process. The observations of Telford and Stopford are discussed and disagreement is expressed with their view that stretching of the first thoracic nerve over the normal first rib in certain cases may cause the symptoms usually attributed to cervical rib. The symptomatology is not discussed, as it is identical with that of cervical rib. An operation for removal of the transverse process through an incision in the posterior triangle is described. Notes with radiograms of seven cases are given, including five cures, one unilateral success in a bilateral case, and one complete failure.

Sternschein, E. The Superior Cervical Ganglion After Pre- and Postganglionic Sections. [Arb. a. d. Neurol. Inst. Wien., XXIII (H. 2), 155. Med. Sc.]

Experiments were chiefly made in rabbits. In some of them the sympathetic was cut either a little above or immediately below the superior cervical ganglion. In a few animals all nerve connections of this ganglion were severed and in two the neck sympathetic was faradized. In two rabbits the carotid artery was ligated on one side in order to deprive the corresponding ganglion of its blood supply. The following results were obtained. After the preganglionic section of the sympathetic, most nerve cells of the ganglion involved undergo a process of partial atrophy associated with diminution and shrinkage of the Nissl substance, which stains more intensely than normally; a spongy aspect of the cytoplasm and a shrinkage of the nucleus are frequently observed. These changes are probably due to the cessation of a tonicotrophic influence which the preganglionic fibers probably have on the ganglion cells. After the postganglionic section of the sympathetic, most nerve cells of the ganglion affected rapidly undergo the well known phenomena of axonal reaction and totally degenerate; neuronophagia and an active proliferation of the capsule cells are observed. After section of all nerve connections of the superior cervical ganglion, all nerve cells undergo severe alterations which can be considered as the sum of the changes found under the experimental condition above mentioned. Prolonged faradization of the sympathetic at

the neck causes an initial chromatolysis of most nerve cells of the superior cervical ganglion, this change being identical with that seen by other authors under similar conditions. After ligature of the carotid, only a certain degree of vacuolization of some nerve cells of the corresponding superior cervical ganglion is occasionally noticed.

Bergamini, M. Treatment of Epidemic Poliomyelitis. [Arch. d. Méd. d. Enf., Vol. XXVI, Sept.]

Bordier's method of treatment was applied on an extensive scale with encouraging results in this 1921 epidemic at Modena. It consists of a combination of roentgen-ray exposures and diathermy. This combined treatment was applied as soon as the subacute phenomena had subsided. Sixteen patients from 5 months to 6 years of age were treated. Four of the children were practically cured; 8 were decidedly and 2 only moderately improved. The 2 others failed to complete the course. The benefit seemed to be proportional to the promptness with which treatment was begun. The best effects were realized when the interval from the onset of the paralysis was not more than 20 or 30 days. The radiotherapy consisted of three sittings on consecutive days each month, exposing the side of the spinal cord in the lumbar or neck region according as the leg or arm was affected. The dose each time was about 6 X units. The diathermy was applied in four or five ten minute sittings in each series, with a 500 or 600 ma. current. A month generally sufficed to overcome the hypothermia and bring the limb to an approximately normal temperature. Then it was ready for the third part of the treatment, rhythmical galvanization of the paralyzed muscles. Twenty daily sittings of 15 to 20 minutes, were followed by 30 or 40 days of rest. The current should not be over 3 or 4 ma. but this electrotherapy should be kept up perseveringly for months and years if necessary. Considerable improvement has been obtained even when the reaction of degeneration was complete.

Sicard, J. A., Paraf, J., and Laplane, L. [Presse Médicale, Vol. XXXI, Oct. 24.]

A new technic of subarachnoid injections of iodized oil for roentgenographic examination of the spinal canal is valuable for localization problems. The iodized oil is absorbed extremely slowly (over two years) but thus far has not shown any ill effects.

Peremans, G. Recurrent Infantile Paralysis. [Le Scalpel, Nov. 17, 1923. B. M. J.]

There are exceptions to the general rule that one attack of infantile paralysis produces immunity. Levaditi, Flexner, and Lewis have demonstrated the presence of antibodies in the blood of patients who have recovered. Nevertheless, well authenticated cases of second attacks have been recorded, including two cases in New York during the 1916 epidemic. Peremans reports the case of a girl, aged four and three-quarter years, whose appetite had been failing for a month, when morning vomiting

began, which increased in frequency, and she had two convulsions, of two minutes' and twenty minutes' duration respectively. On admission she was very weak, tremulous, and held her head between her hands. The pupil reactions were slow; there was slight stiffness of the neck, and Kernig's sign was present on both sides. The knee-jerks were normal; Babinski's sign and ankle-clonus were absent. The temperature was 38.5° C., the pulse rate 104. Tuberculous meningitis was suspected, but no clinical nor laboratory tests substantiated this diagnosis. In fifteen days the patient made a good recovery and was discharged, the final diagnosis being "anterior poliomyelitis." For three months morning vomiting continued either before or after breakfast; she frequently awoke and cried at night, and eight days before her readmission persistent bilious vomiting set in. The child remained in bed complaining of pain in the left loin and the right side of the head; the temperature was normal. Four days later she could not move her legs and screamed if her head were touched; there was no loss of consciousness. Her neck movements were limited and painful, with some stiffness; deglutition was normal and passive movements of the lower limbs did not cause pain. There was flaccid paralysis of the left leg; the left arm was also weak and the left hemithorax moved less than the right; the left abdominal reflex was feeble and the left knee-jerk absent, whilst the right knee-jerk was active. The Babinski, ankle-clonus, and Oppenheim signs were all absent; the temperature 38° C., and the pulse rate 110. The diagnosis of infantile paralysis was confirmed by laboratory tests. A year later, in spite of orthopedic treatment, she had developed talipes equinus. In August, 1922, there was a third attack, accompanied by similar symptoms to the second, but affecting the upper limbs to some extent. She recovered from this, with the exception of a slight atrophy of the intrinsic muscles of the hands.

Cadwalader, W. B., and McConnell, J. W. Sequence and Mode of Development of Symptoms as an Aid to the Diagnosis of Multiple Sclerosis in the Early Stages. [American Journal of the Medical Sciences, Vol. CLXVI, 165.]

These authors think that the apparent infrequency of multiple sclerosis in America is probably due to errors in diagnosis. Opinions differ as to the symptom-complex which is pathognomonic of the disease, especially during the early stages. A diagnosis of multiple sclerosis may be justified even in the absence of the classic Charcot triad of intention tremor, scanning speech and nystagmus. However, in establishing the diagnosis, great attention should be paid to the sequence in the development of the subjective and objective symptoms. The disease to them is a distinct entity, and is, they believe, infectious and inflammatory. However, the same symptoms have been observed following other diseases, such as malarial fever, syphilis, arteriosclerosis, influenza, and epidemic encephalitis. Dur-

ing the earliest stages the symptoms are mild and can be overlooked. They may subside without leaving a trace, and recur later, becoming progressively more intense. The most careful observation is therefore necessary to determine the mode of appearance of these early manifestations. If spastic paraplegia, intention tremor, scanning speech, optic atrophy, and nystagmus are all present, there is no difficulty in diagnosis. Only the early stages present difficulty. Isolated objective signs, such as impairment of vision, ocular paralysis, weakness of one or more of the extremities, and paresthesia are common. They are, however, transitory, and are liable to be overlooked. Most cases present remissions alternating with periods of acute disturbance due to focal lesions. Transitory paralysis may constitute the only objective sign of the disease, and may recur and subside at regular intervals, for months or years, gradually becoming permanent; other manifestations characteristic of the late stages of the disease may subsequently occur. In one case reported the only early manifestation was intermittent diplopia occurring over a period of three years before other characteristics appeared. In another case, irregular attacks of transient blindness preceded the development of optic atrophy. In one case bilateral oculomotor paralysis developed rapidly, and persisted for eighteen months in the absence of other manifestations. Tremor, scanning speech, and weakness of the extremities, later developed. One case presented signs typical of hemiplegia of rapid onset, which had been mistaken for the results of an apoplectic attack due to vascular occlusion. These signs persisted for some time before other manifestations appeared. The classic Charcot symptoms differ from other signs of the disease only in that they are less frequently remittent; however, they may appear as isolated signs. Once established, they tend to become permanent, and to progress. These symptoms indicate more or less widespread distribution of the inflammatory lesions, and are therefore of more importance in diagnosis than are other single signs. Scanning speech, or any other dysarthria, indicates a disturbance in the combined motor function of the respiratory, laryngeal, palatal, lingual, and lip muscles supplied by different cranial nerves; each of these nerves has its origin at a different level within the brainstem, and therefore a lesion sufficiently severe to destroy all of these areas must be extremely diffuse. A purely spinal type of multiple sclerosis is extremely uncommon. The diagnosis of the disease in the presence of spastic paraplegia and loss of abdominal reflexes, without involvement of the brain, is not always justifiable; although the disease may occasionally appear in this form. If these symptoms are followed by the Charcot triad, the diagnosis is clear.

In conclusion the authors emphasize the importance of observing the association and mode of development of symptoms, rather than the isolated manifestations themselves. The appearance of cerebral symptoms preceding or following spinal manifestations is indicative of dissemination of the pathologic process.

Grigsby, G. P. Spina Bifida with Hydrocephalus. [Ken. Med. Jl., Dec., 1923. J. A. M. A.]

The outstanding features of interest in Grigsby's case were: (1) the unusual size of the spinal bifida and the large amount of contained fluid; (2) that the rather sudden release of the spinal fluid apparently had no deleterious effect on the child; (3) that the left-sided paralysis which existed prior to operation has now disappeared; (4) that the extensive spinal defect was satisfactorily closed; (5) the reduction in size of the head and decided improvement in mentality during the last ten days.

5. CEREBELLUM; PONS; PEDUNCLES; MID-BRAIN.

Schaltenbrand, G. Disorders of Movement in Acute Bulbocapnin Poisoning. [Arch. f. exper. Pathol. u. Pharmakol., CIII, 1.]

De Jong, H., u. Schaltenbrand, G. The Effect of Bulbocapnin on Tremor in Paralysis Agitans and Other Maladies. [Klin. Wchnschr., III, 2045; Med. Sc.]

Bulbocapnin is an alkaloid obtained from the root of *Corydalis cava.* According to Peters it is a folk-remedy for tremor, paralysis, and other supposed nervous disorders. This observer (1904) found that in animals it produced a cataleptoid condition of the musculature, increased tear and salivary secretion, and a slowing of respiration. Chemically it is related to apomorphine, but differs from it in the presence of oxygen side-chains and in being dextro-rotatory. According to Fröhlich and Meyer (1920) it produces a tonic contraction in muscle which is unaccompanied by an action current, but de Jong in some earlier recorded experiments found that there is a continuous action current and that de-afferentation of the tonic muscle by intramuscular injections of novocain does not abolish the cataleptoid state therein.

Schaltenbrand repeated Peters' experiments, using various animals as well as the human subject. Hypodermic injections of bulbocapnin were employed. In man there is a general blunting of sensibility and lethargy persisting for some hours. In animals, in which larger doses could be used, other results were observed. The animal stood in a drooping attitude of general flexion, there was some palpable muscular rigidity, while in dogs and monkeys a fine rhythmical tremor developed. In two animals, epileptiform seizures occurred. Examination revealed diminution or abolition of the tonic neck and of the righting reflexes. The animals were apathetic, show dilated pupils and, in some instances, salivation.

De Jong and Schaltenbrand, regarding these effects upon the musculature as "hypokinetic" in nature, deemed it probable that bulbocapnin might be employed with favorable results in tremor of organic nervous origin in man. A series of patients with tremor of diverse origins were given injections ranging up to 0.2 gm. Their paper records the results

obtained from four cases of paralysis agitans, one of cerebellar tremor, and one of "essential tremor." In every case bulbocapnin injection led to a remarkable diminution in the amplitude of the tremor, and this equally in paralysis agitans and the other conditions. Graphic records illustrate these results. Further observations are promised. [See Psychiatrische en Neurologische, Bladen, 1925 (in English). Ed.] [F. M. R. Walshe.]

Snessarew, P. Pathological Anatomy of Chronic Progressive Chorea of Huntington. [Ztschr. f. d. ges. Neurol. u. Psychiat., XCI, 463; Med. Sc.]

A very brief description is given of the pathological changes in various parts of the central nervous system in an isolated case of Huntington's chorea. A more detailed account of neuroglial cells follows: two main types were present, namely, a small cell with a darkly staining nucleus and a larger cell with more protoplasm and less deeply staining nucleus: the latter is classified as "amoeboid." Both types of cells were widely distributed. Many granules were also observed and the author passes into very great detail as to their microscopic and staining character. Very small, ovoid, and fuchsinophil granules were found in the glia cells and endothelium of the vessels. Along the fibrils of the neuroglia further small granules were observed. The author suggests that these granules have some relation to an internal secretion of the neuroglial cells and discusses at length this relation to the fibrinoid bodies of Alzheimer, to the corpora versicolorata of Siegert, and to the corpora amylacea. The pia mater also exhibited pathological changes, especially certain granular changes in the cells. In conclusion, the general hyperplasia of neuroglial tissue is regarded as primarily of hereditary origin, which leads to a "reaction" process as demonstrated by arachnoid neuroglial cells, and eventually to an altered secretory function of the "gliosomes." Practically all the author's theories are based upon various staining reactions shown by very minute bodies which have as yet not been definitely classified. This leaves much ground for criticism and doubt as to the true value of the interpretation laid upon their presence.

Macalister, C. J. Classification of Chorea in Relation to Its Causes. [British Med. Jl., Nov. 8, 1924; J. A. M. A.]

Macalister divides choreas into three groups: (1) The ordinary: rheumatic or toxic type; (2) "stock-brained" cases, related to an inherited tendency, and (3) a climacteric type. There is often little to distinguish these cases so far as the movements of incoördination are concerned, but some of the associated phenomena present considerable distinctions. The interesting fact was revealed that in the so-called "fright" choreas the children were sometimes left-handed or, being right-handed, came of a left-handed stock, whereas the rheumatic children presented this sort of history in a very limited number of cases—probably representing rheuma-

tism in children having the hereditary factor referred to. It was on this account that the nonrheumatic cases became " stock-brained choreas," and it is these cases that Macalister discusses. In a few instances children suffering from this form of chorea have belonged to families in which there were stammerers. The choreic movements probably represent a gross motor ataxia or incoördination which may be regarded as analogous to vocal stammering. As a consequence of fright or other disturbance an unbalancing of coördination is brought about, owing to some unusual relationship of function on the opposite sides of the brain.

Riese, W. Tract Anatomy of the Basal Ganglia. [J. f. Psychol. u. Neurol., XXXI, 81; Med. Sc.]

The observations are based upon the histological study of a series of human and animal brains. The author claims to have amplified our knowledge in respect of the following conclusions: the striopallidal fibers form the great part of a striofugal fiber system. In degeneration preparations they are characterized by their fine caliber. Another component of the striofugal system is a *tractus strio-mesencephalicus ad substantiam nigram.* This arises in the head of the caudate nucleus, traverses the globus pallidus, and ends in the stratum intermedium of the substantia nigra. The fibers composing it are of fine caliber and are myelinated after birth. The term " ansa lenticularis " is purely topographical and the structure so named includes a thick fiber tract lying ventral to the basal ganglion, bordering the internal capsule and reaching the thalamus, and fibers passing along the tract H_2, which in so far as they are of striatal origin arise in the pallidus. The bundle H_1 is predominantly striopetal, but also contains fibers of pallidal origin. The posterior longitudinal bundle is in close connection with the pallidum, both phylogenetically and in respect of its myelination. The basal ganglia and the red nuclei are connected by fiber systems, which are afferent to the latter. There is no evidence of a direct connection between the striatum and the cerebral cortex, but, following lesions of the frontal poles, there is degeneration of fibers passing to the globus pallidus. [F. M. R. Walshe.]

Battain, M. Spasmodic Laughing and Weeping. [Rif. Med., Aug. 4, Vol. XL.]

A clinical study and general discussion of the changes in the putamen found in cases which have had attacks of involuntary laughter or weeping. Unilateral lesions are sufficient to produce it, as well as interruption of pathways from the cortex, as well as direct irritation of the center(?).

Spiegel, A. E. Body Posture and the Corpus Striatum. [Klin. Wchnschr., XXXV, 1568; Med. Sc.]

In a series of experiments on rats and cats, the author and Brouwer found that after hemisection of the cord, or extirpation of one-half of the

cerebellum, the tetanus spasm produced in the hind limbs by injection into both of them of tetanus toxin was less marked on the side of the lesion than upon the normal side. They conclude therefrom that supraspinal centers have an influence on the development of the spasm. On the other hand, unilateral cerebral lesions involving the cortex only have no influence on the spasm produced in this way, but as soon as the corpus striatum is reached and involved the spasm in both hind limbs, especially on the homolateral side, changes from the customary extensor rigidity to rigidity of the hind limbs in flexion. If, in addition, the fibers of the internal capsule be involved, no modification of the spasm appears, indicating a striatal origin of the flexor spasm. Such an animal injected with strychnine still shows the characteristic extensor spasm, despite the absence of one corpus striatum. Spiegel takes this differentiation to indicate that while tetanus spasm is an increased tonic response, strychnine spasm is a function of the phasic variety of contraction, and consists in the fusion of twitch contractions and not in an increased tonic contraction. Hence, the corpus striatum may be regarded as concerned in the development and maintenance of tone, but not in the innervation of phasic contractions.

These conclusions cannot readily be correlated with the observations of Magnus on the "mid-brain" and "thalamus" animals, both of which, deprived of their corpora striata, show a perfectly normal distribution and intensity of muscle tone, and possess all the tonic or postural activities of which the intact animal is capable. [F. M. R. Walshe.]

Hess, L., and Pollak, E. Cerebral Dyspnea. [Med. Klinik, Oct. 12, Vol. XX.]

Hess and Pollak found grave changes in the locus ceruleus in two cases of diabetic coma. Similar changes were also observed in other dyspneic conditions of cerebral origin. They consider this part of the brain as another respiratory center.

Long. A Corpus Striatum Syndrome of Traumatic Origin. [Rev. Méd. de la Suisse Romande, XLIV, November, p. 774.]

Long reports to the Geneva Medical Society a case of a corpus striatum syndrome of traumatic origin. Some days after a fall from a bicycle, with a resulting scalp wound, a meningitic state appeared. Though radiography was negative, trephining showed a fissure of the parietal bone and a subjacent hematoma infected with staphylococci and streptococci. A left hemiparesis resulted from this unilateral lesion, but on the right side synkineses appeared with athetotic movements of the hand and foot, of variable intensity and duration, and without any signs of pyramidal involvement. The persistence of the suppuration with irregular febrile attacks suggested the presence of infectious metastatic foci, and possibly even a central abscess, and the symptoms showed their principal localization: the corpus striatum of the side opposite to the lesion. [Leonard J. Kidd.]

Greenfield, J. G., Poynton, F. J., and Walshe, F. M. R. On Progressive Lenticular Degeneration (Hepato-Lenticular Degeneration). [Quart. Journ. of Med., Vol. XVII.]

This paper discusses the relationship of the condition called by Wilson in 1912 "Progressive Lenticular Degeneration" with that which Fleischer described in the same year as "Pseudo-sclerosis." In the case described in this paper the presence of a deposit of granular greenish-brown pigment in the peripheral zones of Descemet's membrane, and the absence of any gross cavitation or other obvious lesion of the brain, allied the case to Fleischer's pseudo-sclerosis, but the clinical appearance and history, the atrophy of the putamen to half its normal diameter, and the typical cirrhosis of the liver left no doubt that it was a true case of "progressive lenticular degeneration."

In a review of the literature the authors come to the conclusion that all the cases of so-called "pseudo-sclerosis" in which the liver showed a multilobular cirrhosis at autopsy are true cases of "progressive lenticular degeneration," and that the name "pseudo-sclerosis" (based as it is on a superficial and fallacious resemblance of the symptoms to those of disseminated sclerosis) should be dropped from the literature. At the same time they plead for a broadening of the clinical conception of the disease to include cases with rigidity but without tremor or other involuntary movements on the one hand, and those of so-called "torsion spasm" on the other.

Pathologically they find that the lesion is by no means confined to the corpus striatum (although atrophy of the putamen is a constant feature), but that it has, in a large proportion of the recorded cases, been found to attack also the cerebral cortex, the brain stem and the cerebellum. Therefore "progressive lenticular degeneration" can no longer be accurately spoken of as "a system disease of the corpus striatum," and the determination of the functions of the corpus striatum from the examination of clinical material of this nature is impossible. [Author's abstract.]

III. SYMBOLIC NEUROLOGY.

1. PSYCHONEUROSES; PSYCHOLOGY.

Chantriot, P. The Auditory Function in Relation to Talent for Music. [Paris Letter, J. A. M. A., Vol. 81, June 19.]

Dr. Pierre Chantriot recently discussed before the Faculté de médecine of Lyons the early manifestations of musical genius. Chantriot is a musician himself and is sprung from a family of musicians. He stated that it was his endeavor to penetrate the thick cloud which enveloped musical genius and its first manifestations. He studied, in this connection, auditory sensibility and sensory and motor function in musicians,

after having performed several experiments on psychomotor reactions. He would like to have completed his study by researches on the cranium and ears of great masters; but he did not meet with the coöperation of musical conservatories that he had hoped to find.

It is self-evident that the ear constitutes the basis of musical genius. The ear is to the musician what the eye is to the painter. But, though the ear is indispensable for the education of the musician, for the composer it is only secondary aid, for had not Beethoven lost his hearing completely when he composed the wonderful Ninth Symphony, the climax of his immortal work? It has not been proved that the ears of composers are particularly good or characterized by any peculiar formation, as some writers have asserted who claim to have noted in musicians a peculiar inclination of the tympanic membrane. It is doubtless true that, in the development of musical genius, the ear plays a paramount part, since it alone can transmit to the cerebral cortex the impressions that constitute the basis for the ideas of the future composer. It does not necessarily follow that the organ of hearing possesses special physical qualities—at least not such as are perceptible to the investigator; but one must admit that practice may cause the ear to acquire a certain special quality—a certain finesse—that is distinct from auditory acuity. Excellent musicians often possess only a mediocre auditory acuity, associated with an intense musical sensibility.

According to Chantriot, a child acquires a sensibility to rhythm very young. An appreciation for relative height of tones and the relation of tones to one another develops later, except in the case of precocious subjects such as Mozart and Saint-Saëns. From his study of psychomotor reactions in musicians and nonmusicians, Chantriot reached the unexpected conclusion that the auditory psychomotor reaction is longer in musicians, and that the more gifted the musician, the longer the reaction. Genealogical tables published by Chantriot show how great is the influence of education on the musical development of individuals. Rare have been the instances of great composers who have not trained their ear from birth amidst familial musical talent. John Sebastian Bach was less indebted to heredity for the unfolding of his genius than to the fact that he constantly heard musical masterpieces executed by his father, brothers, uncles and others.

Allbutt, C. et al. Spiritual Healing. [J. A. M. A., Vol. 83, Feb. 2, London Letter.]

The report of the committee appointed by the Archbishop of Canterbury to consider and report on the use with prayer of the laying on of hands, of the unction of the sick, and of other spiritual means of healing, has been published by the Society for the Promotion of Christian Knowledge in a pamphlet entitled "The Ministry of Healing." The committee included a number of bishops and other clergy and leaders of the medical profession. Among the latter were Sir Clifford Allbutt; and medical

psychologists, such as Sir Robert Armstrong Jones, Dr. William Brown, Dr. Hadfield and Dr. W. H. Rivers. The committee decided that there were three main lines for its work: 1. The historical question, What is the evidence for what is called "the ministry of healing"? and What was the character of such a ministry if it existed? 2. A comparison between the different methods of healing and their relation to Christian thought. 3. Should a ministry of healing now be recognized? In regard to the second point, after prolonged discussion the committee concluded that religious treatment of bodily illness must be related to other methods of treatment, and that religious treatment aims at something more than the cure of bodily illness and has in view the restoration of the patient's whole nature. The power which heals the body makes use of three methods: (*a*) material, as surgery and drugs; (*b*) psychic, as suggestion and different forms of mental analysis; (*c*) devotional and sacramental. Spiritual healing may be said to be that which uses any of these in reliance on God, though in popular use the term is often confined to the last. In all these methods of healing, faith may be an important element; but, as far as purely physical healing goes, faith works irrespectively of the ground on which it rests. In the third method, in which something more than physical healing is in view, the character of the faith is of primary importance. Treatment from the material side rests on the scientific doctrine that there is a real and objective virtue in certain vegetable and mineral products. At the same time, drugs often depend for their effect on the confidence of the patient both in the physician and in the prescription; that is, faith and suggestion are already at work.

The general name of the second method is psychotherapy. It includes three main departments: (*a*) Reëducation and persuasion aiming at mental and moral adjustment by reason and argument. Such cases as aphonia or functional paralysis can often be thus treated effectively. (*b*) Suggestion aiming at influencing subconscious processes, for it is in the subconscious and unconscious parts of the mind that the source of many mental and moral ills lie. (*c*) Analytic methods, which aim at investigating what are assumed to be the deepest layers of the mind, and depend for success on the discovery of latent "complexes" and morbid processes which have given rise to symptoms. Whether the theories as to the ultimate origin of nervous disease, such as propounded by Freud and Jung, will be confirmed by future investigators, the committee does not feel competent to say. But as spiritual disorder often leads to moral and mental disorders, and indirectly to such physical disorders as hysteria, those who have the "cure of souls" should study the psychologic principles which lie behind the methods of psychic treatment. However, analysis should not be undertaken by persons without considerable medical experience and without working in close connection with a physician.

With the third method—the devotional and sacramental—the committee was more immediately concerned. "Here," it observes, "the appeal is direct to God as the immediate source of all life and health,

without the use of any material means. The appeal has taken various forms, as in Christian science and kindred doctrines. Within the church it has occasioned the revival of systems of healing based on the redemptive work of our Lord. They all spring from the belief that Christ taught that the power of spiritual healing is the natural heritage of Christian people. All healing assumes that disease is an evil to be combated. Theologically stated, this means that health is God's primary will for all his children and that disease is a violation of this orderly condition to be combated in God's name and as a way of carrying out his will. Disease, like other forms of evil, may be permitted by him to exist as a result of man's misuse of his freedom, as a stimulus to human sympathy and research, or as a means of spiritual discipline. Spiritual healing must not exclude medical means. The former not only heals the disease but also raises the whole nature of the patient to a higher level. In other words, in spiritual healing, the healing of the spirit is primary, of the body secondary.

The committee found that those who were applying the truths of Christianity to patients suffering in mind or body, with the definite suggestion that it was the will of God that sickness as well as sin should be overcome, were obtaining remarkable results. But there was no evidence of healing which could not be paralleled by similar cures wrought by psychotherapy without religion, and by cases of spontaneous healing which often occurred even in the gravest cases in ordinary medical practice. No cases were found of those working within the church who did not desire to coöperate with the medical profession. But from religious influence greater results might be expected than from nonreligious methods. No witness desired the licensing of "healers." The committee evinced a general desire for the authorizing of "anointing." There was considerable doubt as to the value of "services of healing," to which crowds of sick folk were invited to come.

Of the medical members of the committee, Dr. W. H. Rivers, the medical psychologist and anthropologist, died in July, 1922. Sir Clifford Allbutt and Sir Robert Armstrong-Jones signed the report with the intimation that they desired not to associate themselves with recommendation on the use of unction.

Donath, Julius. Significance of the Frontal Lobes For the Higher Intellectual Activities. [Deutsche Zeitschrift f. Nhk., March, Vol. 88.]

The author who always merits respectful attention, seeks to establish practically the same conclusions as does Bianchi in his work of similar character although strange to say he does not refer to the Italian author in his considerable bibliography. He first considers the motor centers of the frontal lobes; namely (1) the motor speech area of Broca, (2) the direct fronto-pontine tract which proceeds through the pons to the cerebellum, probably from the first and second frontal convolutions and has

to do with the equilibratory function of the cerebellum, so that it is a well known fact that frontal lobe lesions may give rise to cerebellar ataxia, (3) projection fibers through the subcortical ganglia, (4) association tract bundles, (5) Monakow's fasciculus fronto-centralis carrying impulses for motion from the frontal lobe to the precentral convolution. (6) Two other motor centers, for writing and for music whose exact location is uncertain. That for writing is probably in the second convolution just anterior to the precentral gyrus while that for music is still problematic and very probably closely associated with hand and finger movements in the precentral gyrus. In this connection the author passes on to consider whether or not frontal lobe tumors are responsible for paralysis agitans syndromes and further, whether incontinuence of urine and feces may result from their lesions. Parksonian pictures have apparently resulted from tumors of the frontal lobes but were probably due to pressure affect upon the basal nuclei; bladder and rectal incontinence upon the other hand, in the absence of spinal cord lesion, is probably due to involvement of a center in the frontal lobes, witness the apathy, stupor, confusion attending the incontinence in mental cases as well as early experience with infants. In fairness the findings of many authors where lesions of the frontal lobes apparently have not involved the higher intellectual faculties are quoted at some length. That of Ranschburg is particularly interesting in which a war wound with abscess formation in the frontal lobes resulted in no noteworthy alteration in the intellectual activities, nor those of comparison, perception, abstract thinking, memory and the more intimate relationships of the personality. Also tumors have been found upon autopsy in cases where there was no reduction in mentality beforehand. In regard to such negative findings the author falls back upon the conclusion that more careful investigation would have revealed symptomatology. Upon the other hand a considerable number of cases are cited to support the author's contention, cases in which a disintegration of personality followed from the development of lesions of the frontal lobes. A notable case is that of a twenty-year-old soldier who was shot through the frontal lobe about the height of the first and second gyri. Following the injury there occurred a transitory loss of consciousness, then for two months a mental disturbance resembling a catatonic stupor in which the patient showed no spontaneity of movement, suffered incontinence, could not swallow food placed in his mouth and at times laughed in a foolish manner. At the close of three months this condition improved and he gradually returned to normal. Up to this time there was also a disturbance of gait in which the patient upon all attempts to walk or to stand made incoördinate movements with the trunk and limbs. Another case with a similar history and symptomatology showed a tendency toward perseveration and stereotypy as a final result and remained with a weakened memory, an uneven reduction of intelligence, lack of intuition, euphoria, some excitability, unconsidered behavior. Cases of tumor are also cited and reference made to symptoms of euphoria and jocosity. Passing

attention is paid to the function of the corpus callosum and the psychic disturbance found almost without exception when it is affected, since so many closely associated tracts are involved. Agenesis is usually accompanied by severe mental and physical symptoms, but of late a brain has been investigated in which there was no corpus callosum, although the subject so far as could be ascertained had shown no grave defects as to morality and intelligence, nor in the practical conduct of life. This same reporter had found 12 other similar cases in which only minor mental defects had occurred and explained this by suggesting that in these cases the one hemisphere had taken over the ordinary coördinate movements of both halves of the body and that associative function had been confined to this same hemisphere while the other remained practically functionless. The clinically ascertained psychic disturbances resulting from lesion of the frontal lobes seem to be disturbances of memory such as retrograde amnesia and confabulation, disorders of perception and of the association of ideas, feeble-mindedness and dementia. Weakness of intelligence with inadequate reaction to outer stimuli reveals itself in euphoria, hypomania, jocosity, childish behavior, etc. These are all accompanied by lack of insight. Emotionally there is irritability, a negativistic tendency, loss of sense, etc. The lack of spontaneity results in apathy, carelessness, even catalepsy since thinking is not carried over into movement in spite of the persistence of the necessary reaction patterns. Frantz is quoted at some length to the effect that the frontal lobes probably serve for the acquisition of new information while such as has already been established is preserved in other parts of the brain and therefore not lost after extripation of the frontal lobes. To this the author adds a plea for the conception of the vicarious activity of nerve cells and tracts. And finally the author refers to the relative area of the frontal region in various animals; for example, in man it constitutes 29 per cent of the entire brain cortex; in chimpanzees 16.9 per cent, in a lower grade of monkey 11.3 and in a still lower one 8.3. In dogs the percentage is 6.9, in cats 3.4 and in rabbits 2.2—the boundaries of the analogous region being determined by their cellular architecture.

Sachs, H. The Tempest. [Int. Jl. Psa., Vol. IV, Nos. 1, 2.]

This is largely an historical study relative to the date of the publication of this play, its origin, its purposes, and finally a very penetrating inquiry into its artistic sublimation values relative to Shakespeare's fixations upon his younger daughter Judith and the delivery of her libido over to her husband shortly after which Shakespeare died. It is a most scholarly and fascinating study which should be read in the original so detailed is the analysis.

Buzzard, E. F. Traumatic Neurasthenia. [Lancet, Dec. 15, 1923.]

The signs and symptoms of traumatic neurasthenia, according to Buzzard, are those of an anxiety neurosis. It should be regarded as an emo-

tional state, dependent not on any physical disturbance caused by trauma but on a number of psychologic factors. Although the knowledge that an injury has been sustained exerts a powerful influence in the development of neurasthenia, the latter is not the result of trauma. Buzzard prefers the term "anxiety neurosis following trauma."

Kleitman, N. The Effects of Prolonged Sleeplessness in Man. [Am. Jl. Phy., Vol. 66, Sept.]

Considering the importance of sleep for the human economy surprisingly few investigations have been made on the subject. Six young male adults underwent periods of experimental insomnia varying from forty to one hundred and fifteen hours. In order to prevent the subjects from sleeping it was found necessary that they should carry out almost continuous slight muscular exercise by moving about with short periods of rest. Careful observations were made. It was found that muscular relaxation induces sleep under normal conditions, but practically precipitates sleep under conditions of experimental insomnia. Blood sugar, alkaline reserve of the blood and plasma, percentage of hæmoglobin, percentage of corpuscles, red and white cell count, body weight, basal metabolic rate, appetite, temperature, ability to name letters and to do mental arithmetic, all showed no variation from the normal during the period of sleeplessness. Respiration, heart rate and blood pressure showed a definite decrease in insomnia, but this decrease was mainly due to greater muscular relaxation of the sleepy subject. A Babinski reflex could be elicited in every subject tested during the sleep that followed insomnia. It is interpreted as indicating a functional block in the pyramidal system of fibers. There is a greater excretion of phosphates and acid at night; but on reversed routine with the subject sleeping in the daytime this condition is reversed, indicating that increased secretion is due to sleep. The excretion of total nitrogen and of creatinin shows little diurnal variation and is unaffected by either insomnia or reversed routine. There is some evidence that the diurnal temperature variation is due to alternation of sleep and wakefulness and the temperature wave tends to be effaced during prolonged insomnia. The onset of sleep is probably due to complete muscular relaxation, voluntary or involuntary.

Escomel, E. Climatic Psychoneurosis. [Rev. de Med. y Cir., Sept. 25, 1923. J. A. M. A.]

In Arequipa, Peru, a large number of individuals complain of peculiar moods of depression or exaltation on certain days. Arequipa is the second largest city in Peru, and has an altitude of about 7,000 feet. On these days the author states the air is charged with electricity, and even animals and children are restless and different. All classes are affected, but brain workers and nervous women suffer most. [Hellpach has written an interesting medical work on these geographical reactions. Ed.]

Baldi, F. Instincts and Neuroses. [Ann. di Neur., Aug. 31, 1923.]

In the war neurosis a clear example of the working of a "defense instinct." Mental health depends on an equilibrium between the instinctive tendencies and the forces which control them. The neurosis is an expression of predominance of the biologically older instinctive forces over the more recent higher psychic qualities.

Elder, W. The Left-Handed Child. [Corresp. B. M. J., June 14, 1924.]

"Over twenty-five years ago I made some observations on this subject, which I published in my book on *Aphasia and the Cerebral Speech Mechanism,* and in an article on mirror-writing in the *Encyclopaedia Medica.* It would take too much space to go into the explanation there suggested of how mirror-writing is produced, but I may shortly say that I believe that the movements which produce mirror-writing by the left hand are initiated, influenced, and guided by the cortical neuron groupings of the left cerebral hemisphere—that is, the same cortical neuron groupings that guide the right hand in writing. Mirror-writing is a well recognized peculiarity, but is not so uncommon as is supposed. From my investigations of a large number of individuals of different ages I found a certain percentage were mirror-writers, some quite expert, others showing a tendency to it more or less. I found that it was more common in those over fifteen years of age and in expert writers than in those under fifteen and those who were only learning to write.

It is sometimes shown by hemiplegics, and Ireland found it exhibited by a proportion of weak-minded children. Mills of Philadelphia records that "the left-handed show a physiological tendency to mirror-writing." It is interesting to record that one of Leonardo da Vinci's manuscripts is an example of mirror-writing—some suppose to preserve the work from superficial readers, but another explanation may be that, according to a priest who visited Leonardo during the last years of his life, Leonardo had paralysis of the right hand and so may have been an example of a mirror-writer after cerebral disease."

"An interesting fact is that, in those who can write with both hands and exhibit true mirror-writing with the left hand, the writing with the left hand is exactly like that with the right hand when the one is looked at in the mirror. Both are seen to be the same handwritings. By true mirror-writers I do not mean anyone who has simply trained himself to write mirror fashion with the left hand. Such a one has simply trained his left hand to do certain expert movements. Such writing may or may not be like the right-hand writing. But true or natural mirror-writing has a singular resemblance to the usual handwriting. An example will be found illustrated in my book above referred to, in a hospital patient who was not an expert writer.

"The patients of your two recent correspondents are somewhat unusual, in that they seem both to show the left-handed tendency to an extreme extent, just as some people are abnormally right-handed and can hardly

do anything requiring precision with the left hand. It is a congenital or inherited preëminence of the whole or part of the right cerebral hemisphere instead of the left, as in the majority of persons. Education can do much in developing the use of the hand which from birth has taken the second place in all special or expert movements. A child showing sinistral preëminence can by training become ambidextrous, but it is much more difficult, if at all possible, to develop it in a child showing dextral preëminence. The reason of this is probably to be found in the congenital structural associations of the neurons. Unless there has been some disease or congenital defect of the nervous system, patient persistence in training the right hand will ultimately succeed. Allowing the child to write mirror fashion with the left hand whilst the right is being trained will not, I think, prevent success, because a considerable number of people, if a pencil is put into each hand, are able to write in the usual way with the right hand whilst the left hand writes at the same time in the mirror fashion.

"In answer to the question of Dr. Clowes (April 19, p. 729), I cannot see that there can be any danger to the nervous system in patiently training the child to write with her right hand. She may find it irksome at first, just as some of us did when we first mounted a bicycle, but with patience and perseverance we gradually became expert, and what was at first irksome became a pleasure.

Meagher, J. F. W. Mental Hygiene, Some of Its More Important Aspects. [Jl. Med. Soc. of N. J., 1923.]

The majority of "functional nervous disorders" belong in the realm of mental hygiene. Some of the aims of mental hygiene are to keep body and mind in harmonious working order; to avoid unnecessary stress and strain and needless worry; to get the individual to really know himself and to learn how to supplant persistent dissatisfaction by contentment; to be useful not only to himself but to society; to direct him to that profession or industry where work is satisfactory, and becomes a pleasure; to learn how to follow the standards of the herd (society) comfortably, and at the same time to gratify his own wishes in a socially approved way; and by no means the least important of all, to develop a happy emotional tone in his family life. There are certain bad traits and trends which, if in excess, favor mental upsets. An individual with numerous satisfactory outlets for his feelings has no occasion for brooding. One must always distinguish genuine traits from compensatory ones. The emotional life has the greatest determining value on conduct; the intellect exerts chiefly a discriminative or restraining influence. Mental readjustments cannot be made by surgery nor by endocrines. Every patient may study his capabilities and limitations. All students of mental hygiene agree that the first five years of life are the most important from a psychological standpoint. It is during this time that the genuine traits and trends are formed. The attitude of the parent is of more importance

than what she says. In inculcating necessary repressions in the child, it is not necessary to harshly subdue the child. It is a fact that in treating some nervous patients, unless you also treat some other member of the family, you will not get results. Normal family love is stimulating, but for an individual to be fastened to a family to the point of losing interest in all outside affairs is crippling. It is a mistake for physicians to advise marriage as a panacea for all sorts of nervous ills. Whether it will be beneficial or not will depend on the traits and trends of the two individuals. For sex, which psychobiologically is of the greatest importance, is often a hard problem for a neurotic to properly adjust to. Too many people react to all questions of sex either prudishly or vulgarly. The important causes of mental upsets should be stressed,—as fear, anxiety, hatred, various conflicts, feeling of insecurity, unhappy home, etc. The fear of insanity is a haunting fear of many of these patients. We prefer to stress the importance of environmental influences over heredity on practical grounds: you cannot influence the latter. In treating these cases, platitudes will not supplant intelligent analysis,—nor will surgery or drugs. Trips for these patients are more often harmful than beneficial. The patient must learn to know himself and how to handle his conflicts; he must learn to develop normal personal, family, and social attitudes, and have enough healthy outlets for his energies. To be mentally sound and happy, every adult must have an aim and object in life. Abnormal selfishness is a poor aid for recovery. The value of psychoanalysis has been proved, but it must be used in the treatment of disease by medical men trained in this method. They know which patients should be analyzed, and which it would be a danger to analyze. Even the critics of psychoanalysis admit the dynamic value of the wish. Nervous patients are the particular object of the quack. If these patients had an intelligent idea of mental hygiene, they would not so easily fall victims to quacks. [Author's abstract.]

Chapman, R. McC. Control of Sleeplessness. [Am. Jl. Psych., Vol. 3, Jan.]

The two most important hydrotherapeutic procedures for sleeplessness in psychotic cases are, the continuous bath and the cold wet sheet pack. The use of drugs in sleeplessness should be forbidden save in exceptional instances. Among the drugs that are most valuable, Chapman includes the bromids, trional, barbital (veronal), sulphonal and paraldehyd. Chloral hydrate is useful, but decidedly undesirable for frequent administration. Drugs should be varied, no one drug being used over a long period of time. There should be frequent discontinuance, and a placebo substituted if desired. In the psychoneuroses, the scientific and most desirable treatment must be, when possible, the release through psychoanalysis of the underlying conflict, with the consequent relief of sleeplessness and other symptoms.

Book Reviews

Alexander, G., Marburg, O., and Brunner, H. Handbuch der Neurologies des Ohres. III Band. [Urban und Schwarzenberg, Berlin u. Vienna, Mk. 60.]

This magnificent piece of work draws to a close in this Vol. III, and editors and publishers alike are to be congratulated upon the bold conception, the faithful portrayal of the subject-matter and the excellent bookmaking which sets the contents off to best advantage.

In the present volume Marburg opens with a masterly chapter upon the tumors of the cochlear and vestibular systems and of the cerebellum, including cerebello-pontine angle tumors, tumors of the pes, tumors of the corpora quadrigemina, pons and medulla. The chapter is a complete monograph in itself, copiously illustrated from macroscopic and microscopic sources and gives complete clinical and pathophysiological details. Prof. W. Denk of Vienna contributes a chapter upon the removal of brain tumors of value to the neurosurgeon. A short but useful chapter is contributed by M. Sgahtzer of Vienna upon X-ray treatment of the tumors of this region.

In chapter 7 Dr. E. Pollak of Vienna discusses very exhaustively the dyskinesias and dystonias with special reference to the involvements of the cochlear and vestibular apparatus. This chapter is rich in clinical novelties by reason of a thorough entrance into the anomalies of these systems in encephalitis cases. The general problems of tonus are well discussed.

Chapter 8 upon the neuroses and psychoses involving ear mechanisms is particularly valuable since there has been but little systematic gathering of the literature along these lines. Drs. R. Leidler and P. Loewy Raimann, Urbantschitsch, Stransky, Ohm, Abels, Spiegel, Zappert and Palthe are the authors of the respective sections.

Finally G. Alexander and J. Bauer and Stein contribute a hundred pages to the endocrine relations of the ear apparatus.

The work is of value not only to neurologists and otologists but to all medical men since the auditory and vestibular mechanisms play so large a rôle in daily living and are subject to so many disturbances.

Freud, Sigm. Studien zur Psychoanalyse der Neurosen, aus der Jahren 1913–1925. [Internationaler Psychoanalytischer Verlag, Leipzig, Wien, Zurich, Mk. 8.]

A collection of papers written in the past twelve years upon various neuroses is here brought together. The chief reason is the close relationship in subject-matter which permits the development

of the author's conceptions to be unfolded more readily, to the reader, than in the reading from the collected works. Here are discussed the disposition to the compulsion neuroses, two childish lies, paranoia, instinct displacements particularly anal eroticisms, a child is being beaten, idea associations of a four-year-old child, psychogenesis of a female homosexual, paranoia and homosexuality, infantile genital organization, the economic problem in masochism, reality loss in the neuroses and psychoses, resistance to psychoanalysis, negation, the psychical results of genital differences in the sexes.

These are the titles of the papers here brought together. Needless to say they are welcome in this form, especially when they can be carried in the pocket, and as stated, develop so consistently the advancing series of working conceptions of the neuroses in comparison with which all other conceptions seem like groping in the dark of self-deception.

Roffenstein, Gaston. Das Problem des psychologischen Verstehens. [Julius Puttmann, Verlagsbuchhandlung, Stuttgart. Mk. 7.50.]

A Study of the Foundation of Psychology, Psychoanalysis and Individual Psychology is the subtitle of this No. 15 of the Kronfeld series of Kleine Schriften zur Seelenforschung. It is not a large work but it is closely printed in small type and not only are there many words, but the thoughts are closely knit, making it a book one must study attentively.

What is meant by "understanding"—ourselves, others, a natural phenomenon, a law—this is an old problem, and without writing a complete work upon epistemology the author enters into the many efforts to portray the processes and define their nature.

One must read the book to get at it—it defies summarizing in the space at our disposal. It is not easy reading but it is promising and stimulating.

Cornelius, et al. Bericht der Sondertagung des Vereins der Aerzte für Nervenmassage. [Verlag von Georg Thieme, Leipzig. Mk. 3.60.]

In Germany there are enough physicians interested in nerve-massage to have a congress. There are 150 members of this society and the present volume of 100 pages contains the papers or abstracts of those given at the meeting in Berlin on the 14–15 April, 1925. Dr. Cornelius, whose work is fairly familiar to neurologists opened the congress with a short paper on the history of the movement and how he came to learn, through an illness of his own, of the significance of painful points in the muscles and tendons and of the means to influence them. Eighteen papers are presented upon various issues bearing upon massage in general, but more particularly upon "nerve point massage."

It is an interesting series of papers upon a small but important field of neurological therapy.

Robitsek, Alfred. Der Kotillon. Ein Beitrag zur Sexualsymbolik. [Internationaler Psychoanalytischer Verlag, Leipzig, Vienna, Zurich.]

A small monograph of forty pages, reprinted from the pages of "*Imago,*" dealing with dance symbolism and particularly that form known as the cotillon—now hardly to be seen, save on special occasions. The unconscious sexual significance of the various figures, dresses, favors, etc., etc., is interestingly told. Since man sexualizes everything in the course of civilization and culture this is a study well adapted to show just how the unconscious repressions work to gratify the instinctive cravings through indirect channels.

Bruni, Champy, Gley, Lugaro, Thorek, e Voronoff. La Funzione Endocrina delle Ghiandole Sessuali. [Dell Istituto Sieroterapico, Milanese.]

This work of 240 pages contains papers by the authors of our title given at a conference of the serum institute of Milan. Champy writes upon the sexual characters, their determination and their biology; Gley upon the action of the hormones, upon secondary sex characters; Bruni upon the anatomical basis of ovarian correlation; Lugaro deals with the correlations between psychical function and the gonads; Vornoff upon rejuvenation, and Thorek upon clinical aspects of the endocrinology of the testicles. A valuable series of papers.

Heller, Theodor. Grundriss der Heilpädagogik. [Dritte, umgearbeitete Auflage, Wilhelm Engelmann, Verlag, Leipzig.]

A book of over 700 pages which reaches a third edition must certainly have some merit. Furthermore the author is director of a Heilpädagoschen Anstalt in Vienna and therefore speaks from experience. Pedagogy for the inferior variant, chiefly for various grades of feeblemindedness, we are told, has not stood still in recent years. In spite of the war and most unfavorable social-economic conditions an advance has been made. School reform has been going on in the meantime, but inasmuch as the "heilpedagogic" methods have anticipated these it has little to learn from so-called "normal" pedagogy, in fact, the reverse has been the real situation. Care and training of psychopathic children has been advanced considerably and the author discusses the methods which have arisen to take care of the education of all children who are not well handled in the schools.

A glance at the chapter headings will reveal the scope of the book. Part I. General psychical developmental defects. Here are considered: idiocy, imbecility, morons, acquired feeblemindedness as with epilepsy, speech disturbances, infantilism, Cretinism, Mongolianism, etc. Part II deals with the pedagogic therapy and prophylaxis of nervous and psychopathic constitutions. Here chapters deal with nervous constitutional anomalies, psychopathic constitutional anomalies and those suffering from hysteria.

The work is modern, thoroughly worked out and quite practical. It is well worth reading and holding for reference.

Borries, G. V. Th. Fixation und Nystagmus. [T. L. Eftf, Copenhagen.]

A clinical experimental study of the numerous problems concerned with eyeball fixation and nystagmus with a series of interesting discussions of the various points of view. After defining "fixation" the author discusses passive or vestibular, and active or optic fixation. Passive optic fixation and passive optic nystagmus are then taken up, and further fixation with minimal head rotation. Foveal and extrafoveal fixation are taken up in a later section.

He then passes on to a discussion of the active eye movements in man, paying particular attention to the slow and the quick movements. This is followed by an experimental study of optokinetic nystagmus and this delightful little monograph closes with the consideration of optokinetic nystagmus in which a new form of inversion is described by the author.

Seeling, Otto. Die Psychoanalyse in Pädagoscher Beleuchtung. [Pyramidenverlag Dr. Schwarz & Co., Berlin.]

A short summary of psychoanalytic principles as applied to pedagogy, with a few illustrative cases taken from the works of well known writers interested in the educational aspects of child training.

Brugsch, Th., and Lewy, F. H. Die Biologie der Person. Lieferung 3, Band. 1, pp. 749–1051. Name and Subject Index. [Urban & Schwarzenberg, Berlin and Wien. Marks 19.80.]

With this section Vol. I of this new and striking enterprise is finished. It has 300 pages and contains but two chapters. Dr. Victor Lebzelter of Vienna writes the chapter upon Constitution and Race, Dr. H. Ullmann of Berlin that of "The Life Span of Mankind." The first constitutes an intriguing chapter upon ethnology, not limited to color, nor length of hair, nor shape of skull, but including disease incidence, susceptibilities to infection, and a host of questions of medical interest. Naturally much condensation, and not a little of generalization is found, but this has been skilfully handled, the modus not being ultra dogmatic. The paragraphs or pages upon distribution of disease and racial factors are particularly well documented.

The second monograph opens up with a discussion of the relations between constitutional make-up and length of life. It, too, avoids a stilted mathematical boredomness usually found in such studies, notably those of the life insurance type of statistics. The life span in the plant world is interestingly touched upon, then that of lower animals, then of different races or types of infancy, childhood, adolescence, of occupational groups, etc., etc., etc. Even this fleeting glance at the skeleton of the material indicates the breadth of the treatment of the subject.

We feel we can most heartily recommend this work to our readers, especially those dealing with constitutional conceptions.

Birnbaum, Karl. Die psychischen Heilmethoden. Für aerztliches Studium und Praxis von K. Birnbaum, H. v. Hattinberg, G. R. Heyer, E. Jolowicz, A. Kronfeld, E. Wexberg. [Georg Thieme, Verlag. Leipzig.]

The significance of, and value attached to psychotherapy has steadily increased since the World War most dramatically pushed its importance into the foreground. Undoubtedly many of the most outstanding factors have more or less retreated into the background, but enough remains to bear witness to the fact that the mental mechanisms in the human organism are no less valuable than his somatic activities—in fact the latter have little understanding without a knowledge of the former.

A certain amount of crystallization in this field has become manifest and the present volume, edited by Birnbaum would set itself the task to give a systematic review of the more important psychotherapeutic methods which have come into fairly clear understanding.

Here he has collected a series of smaller monographic presentations by a number of the younger workers in this domain. In this volume Birnbaum first outlines the general situation and offers a very comprehensive review of the entire theoretical foundations of psychotherapy. His is a very valuable contribution.

Jolowicz discusses Suggestion Therapy. Heyer takes up Hypnosis and Hypnotherapy. v. Hattinberg deals with Psychoanalysis, chiefly from the Freudian viewpoint, while Wexberg contributes a clear outline of the Adlerian Individual Psychology. Kronfeld offers an extremely philosophical section upon what he calls Psychagogic or Psychotherapeutic Pedagogy. This is the final chapter.

The work as a whole is one to be most highly recommended. It shows very clearly the general trends now uppermost in psychotherapeutic activities, and, above all, clearly indicates that there is no sovereign method for all of the complex difficulties of human mental maladaptations. Its catholic character commends it, especially as offering a large vision of the field in which myopic tendencies towards narrower perspectives are all too prevalent.

N. B.—All business communications should be made to Journal of Nervous and Mental Disease, 64 West 56th St., New York.

All editorial communications should be made to Dr. Smith Ely Jelliffe, Managing Editor, 64 West 56th St., New York.

Obituary

LEONARDO BIANCHI

The 13th of April Leonardo Bianchi suddenly died in Naples at the age of 80. His death is a real loss to neuro-psychiatry as Bianchi belonged to the very small class of men who consider teaching and investigation work as a true mission to which they devote their entire enthusiasm and work capacity.

Bianchi was born on the fifth of April, 1848, in S. Bartolomeo in Galdo and was graduated in medicine in 1871. He soon was attracted to the still unexplored fields of neurology and psychiatry and very judiciously his efforts were at first directed to acquire the fundamental notions of anatomy and physiology of the central nervous system. In this early period of his training he contributed to the advancement of neurology by his important investigations on the electric stimulation of the motor cortex and by his original studies on Wernicke's aphasia. In 1888 Bianchi was made professor of psychiatry at the University of Palermo and in 1890 transferred, by invitation, to the chair of nervous and mental diseases of the university at Naples, which he occupied until 1923, when he reached the age limit for the professorship.

Among the most important contributions of Bianchi to neuro-psychiatry I will only mention his studies on the parietal syndrome which has been called by some authors "Bianchi's syndrome," his studies on the associative bundles of the cerebral cortex, his studies on acute delirium and those on aphasic dementia. In this country the name of Bianchi is especially linked with his very important and very original work on the mechanism of the frontal lobes which is a quite vivid reflection of his brilliancy of mind, dominant character of Bianchi's personality. He also collaborated in many international treatises of medicine and has published the well known textbook on psychiatry, translated in English, and which is a clear exposure of Bianchi's conception of mental diseases. Lately he was deeply interested in eugenic and mental hygiene problems.

Brilliant talker and exceptional teacher, Bianchi had fortunately, during his life all the recognition and credit that really was due him. Politically he also reached the highest positions, having been deputy, senator and secretary of state once in the Department of Public Instruction (1905). Italian science is indebted to him for the

Leonardo Bianchi

establishment of a university chair in anthropology, a chair which was first occupied by such a man as Cesare Lombroso. A. Ferraro.

Vol. 65 JUNE, 1927 No. 6

The Journal

OF

Nervous and Mental Disease

An American Journal of Neuropsychiatry, Founded in 1874

Original Articles

THE PUPILS AS AN AID TO THE DIAGNOSIS IN STATES OF COMA *

By William C. Menninger, M.D.

TOPEKA, KANSAS

Many patients are first seen in a state of coma. The absence of a history makes the physical signs of primary importance in a diagnosis. Although many suggestions have been made regarding various points in the diagnosis of such cases, few studies have been made regarding the pupils. Examination of them can be readily and frequently made and consequently they may be a significant key to the solution. The interpretation of their reactions is difficult because of the darkness enshrouding their physiology, but an attempt is made in this paper to show that in some cases they may be an important aid in a differential diagnosis.

Since their interpretation will only be possible as based on a large series of observations, the present study was made of the pupils in some of the most common forms of coma: alcoholism, diabetic coma, uremic coma, cerebral hemorrhage, pontine hemorrhage, carbon monoxide poisoning, and fractured skull. The cases were from the wards of the Second Medical Division of Bellevue Hospital and with only a few exceptions were examined by the writer. Observations in cases of coma from other causes (heat stroke, various drug poisonings, epilepsy, etc.) were made, but because of the small number of cases they are not included in this report.

* From the Second Medical Division, Bellevue Hospital and Department of Medicine, Cornell University Medical College.

Alcoholic Coma

There were fifty-eight cases of acute alcoholism, the patient being unresponsive to any form of stimulation at the time the initial observations were recorded. Cases which were stuporous but not in coma were not included, since it was desired to determine the diagnostic value of the pupillary reactions only in cases of complete coma. The diagnosis in every case was verified by the clinical course and the history subsequently obtained. Only one case was fatal, the diagnosis being verified by necropsy.

The findings are given in Table I:

TABLE I

Pupils in Alcoholic Coma

Total number of cases	58	
Anisocoria	8	13.8%
Size:		
Dilated	7	12.0%
Mid-dilation	23	39.9%
Contracted	25	43.1%
Not given	3	5.0%
Reaction to light:		
Promptly	26	44.8%
Sluggishly	11	19.0%
Fixed	21	36.2%

Anisocoria: Of the fifty-eight cases, eight presented pupils of unequal size. In three of these cases the patient was over sixty-five years of age, and the inequality may have been due to changes with age. However, one of these cases presented equal pupils subsequent to his intoxicated state. This was also observed in several of the other cases with anisocoria, although not in all.

Inequality of the pupils is regarded by many as a normal developmental or physiological condition and others always regard it as a pathological condition. Its frequency in alcoholism as indicated by this small series of complete comatose cases is high. Rolleston (49) and Hall (18) both briefly state that the pupils are equal in this condition. On the other hand, Hunt (23) states that inequality is especially common; Lewis (29) lists alcohol as a cause of anisocoria, and Uhthoff (56) in 1,000 cases of alcoholism found a marked difference in the size in twenty-five cases. Lundsgaard (31) notes anisocoria 22 times in 157 cases studied. Vogt (57) reports a case in his series in which the pupils reacted unequally to light, consequently being of different size.

The significance of this feature of the pupils in alcoholism seems slight. It seems questionable to the writer whether there is any relation between its occurrence and the intoxication. Uhthoff's figure

is considerably below the frequency of this condition, which the writer has observed in a large number of apparently normal individuals.

Size of Pupil: In the present series of 58 cases, only 7 were dilated (over 4 mm.), 23 were in mid-dilation (between 2 mm. and 4 mm.), 25 contracted (2 mm. or less), and in 3 cases no note was made of this point. The " pin-point " pupil was relatively infrequent.

It is of special interest that the majority of the cases presented a contracted pupil, in view of the fact that many writers on this subject describe them as dilated (Osler and McCrae,(44) Purves-Stewart,(46) Fussell,(14) Pick and Hecht,(45) Rolleston,(49) Caille (7)). Others, while noting contraction in certain cases, describe the pupils as " more commonly dilated " (Wilson,(64) Holland (21)). Hall (18) states they are normal in size or dilated. Wilbrand and Saenger,(62) who have devoted an entire volume to the disturbances of the pupil, describe the pupil in acute alcoholism as contracted. Scudder (50) briefly describes the pupils of alcoholic coma as " normal."

Reaction: Of 58 cases, 37 reacted to light stimulation and 21 were fixed. Of those reacting to light, 11 were sluggish.

Sluggishly reacting or fixed pupils have been noted by many workers, although Fussell,(14) under the discussion of alcoholic coma, states that irresponsive pupils " will be absent." Crothers (8) states that the light reflex may be abolished. Holland regards sensitive pupils as a good prognostic sign, and Purves-Stewart (47) states that sluggish pupils are the usual finding. Gudden (17) noted various stages from diminished pupillary light reactions to complete iridoplegia and that following the intoxicated state the pupillary disturbance was much less marked or returned completely to normal. Cases in which mental cloudiness persisted presented pupillary disturbances of longer duration.

In an analysis of these cases it should be considered that many of them are unquestionably chronic alcoholics, and the pupil fixation may be the result of chronic alcoholism. Siemerling (52) describes pupil fixation as a common finding in this condition. Uhthoff (56) collected pupillary data on 4,000 cases of mental disease reported by Moeli,(38) Thomsen,(54) and Siemerling,(52) 492 of which showed iridoplegia; of this number 11 (2.2 per cent) were cases of alcoholism. Retzlaff (48) noted in 285 cases of chronic alcoholism four cases with pupil fixation and 28 with sluggish reactions. Nonne,(39) in 1,460 cases of alcoholism examined in Hamburg from 1905 to 1907, found 18 cases with fixed pupils and 60 cases with sluggish pupil reactions.

Lundsgaard (31) noted in 157 cases 5 with "dull reaction" and 1 with Argyll-Robertson pupil. Cases of chronic alcoholism with Argyll-Robertson pupils, but with entirely negative findings for syphilis, have been reported by Nonne,(40) Barnes,(2) Mees,(34) Fuchs,(13) Menninger,(35) Kramer,(26) Oppenheim.(42)

The question of Argyll-Robertson pupils of alcoholic etiology with entire absence of syphilis has been repeatedly discussed. Wilbrand and Saenger regard some of the reported cases as presenting this single somatic symptom of organic disease of the nervous system as the result of alcohol and not as the expression of peripheral centripetal optic nerve disease or as a sign in the development of a previous existing syphilitic disease of the brain or spinal cord. Bumke (6) is not convinced that it is as common in alcoholism as the many observations would indicate, since many such records were made before the serologic diagnosis of syphilis was perfected. However, he is certain that alcohol aids in the formation of this phenomenon and that consequently it occurs in both drinkers and syphilitics. He states further that "we could also demonstrate that the most frequent disturbance of innervation of the iris in alcoholism is sluggishness of the pupillary reactions, rarely an absolute fixed pupil. And that in one stage of the disease during recovery of this condition there is a transitory convergence reaction better than the light reaction so that the picture will simulate the Robertson phenomenon." Wilbrand and Saenger quote Weilers (59) that in over 1,000 alcoholic cases examined, they come to the conclusion that persistent pupil fixation following alcoholic abuse as the only cause is not observed.

Vogt (57) examined the action of alcohol on the pupillary reactions in mental disease. In normal individuals he observed no effect. In about a third of the mental cases delayed reactions occurred after small single doses of alcohol. Weber (58) points out that "imbeciles, degenerates, and cases of exhaustion" show the symptom of fixed pupils after quantities of alcohol which do not produce psychic disturbances. Stapel (53) also studied the reaction in mental cases and found the pupillary alterations more pronounced in mental cases than in normals, appearing with smaller doses, more quickly, more intensively, and more continuously.

The actual pharmacodynamics of alcohol should be considered in determining the effect on the pupil. Despite the many studies made of alcohol, its pharmacology does not seem clear. Hatcher (19) states that the "vagus center . . . is probably more affected directly." He mentions various evidences of sympathetic stimulation—rapid pulse, vasodilation and rapid breathing, but calls attention

to the fact that large doses slow respiration, this being probably a central action. Cushney (10) states that flushing seems to arise from vasomotor action but is not clear. Consequently while alcohol produces certain definite and obvious effects, the mechanism is not clear.

Diabetic Coma

Observations were made on 10 cases of diabetic coma, of which 6 were fatal cases. The blood Wassermann test was negative in every case. The findings are given in Table II:

TABLE II

Pupils in Diabetic Coma

Number of cases	10
Anisocoria	0
Size:	
Dilated	1
Mid-dilation	6
Contracted	3
Reaction to light:	
Promptly	6
Sluggishly	2
Fixed	2

The only reference to the status of the pupils in diabetic coma found was in a differential diagnosis given by Crothers, who only states the pupils are dilated.

One should also consider in these cases the possibility of changes present in the pupil before the onset of the comatose state. Leber (27) has described dilated fixation of the pupil in diabetes. Fischer (12) has observed sluggish pupil reactions in two cases, but in both cases tabes could not be entirely ruled out and both were chronic users of nicotine. Nonne (41) reported a case of myotonic reaction in a diabetic and another case in which the light reflex was fixed and the convergence reaction sluggish. Grube (16) has published two cases of absolute paralysis of the pupil in diabetes. Westphal (61) has reported a mental case in which there was entirely negative serology for syphilis who developed fixed pupillary reflexes during a severe stage of the diabetes which cleared with the diabetes. Biermann (3) also reported a severe case of diabetes with pupil fixation in which he is certain he has ruled out alcohol, syphilis, and tuberculosis. Liebers (30) describes a case of cerebellar disease associated with diabetes mellitus in which there was a bilateral pupil fixation.

Bumke,(6) in 1911, reviewing some of the reported cases, regards the reports as unconvincing that a typical reflex paralysis of the pupil occurs as the result of diabetes. Wilbrand and Saenger (62) also question the direct association but accept the reported cases, although

regarding them as failing to prove whether the fixed pupils are the result of intoxication or hemorrhage in the region of the sphincter nucleus or whether the primary basis for this sign is here also to be sought in syphilis.

In the cases of this series there is no uniformity in the occurrence of any anomaly. It is of interest to note that two cases, both of which were fatal, showed fixation to light, and although the serum Wassermann was negative, syphilis cannot be entirely ruled out. It seems purely speculation as to the mechanism in cases of pupillary anomalies occurring associated with diabetes mellitus, but some form of intoxication seems more likely than a local lesion.

Uremic Coma

Eight cases of uremia in complete coma were observed. Complete studies were made of all of these cases and little doubt remains as to the correct diagnosis. All eight cases were fatal. The lowest blood nonprotein nitrogen in any case was 104 mgm. per 100 c.c., and the highest was 319 mgm. per 100 c.c. The state of the pupils in these cases was as follows:

TABLE III

Pupils in Uremic Coma

Total cases	8
Anisocoria	1
Size:	
Dilated	0
Mid-dilation	4
Contracted	2
Not noted	2
Reaction to light:	
Prompt	0
Retarded	2
Sluggish	5
Fixed	1

The status of the pupils in uremia has been subject to some controversy, but much less attention has been paid to them than in most other forms of coma. Senator (51) states that at the height of an attack they are dilated and react sluggishly or not at all to light. It might be said that the five cases above reported as acting sluggishly all reacted through a very small arc. However, Senator further states that a noteworthy point of distinction between chronic and acute uremia is the frequency of myosis in the former. This agrees with B. von Wernigk,(60) who found that one of the first signs of an uremic state was dilation of the pupils, and Brooks,(4) who states they are wide and fixed in uremic convulsions. Wilson (63) describes the pupils as more commonly slightly contracted than dilated but are

without diagnostic significance. Crothers (8) briefly states that the pupils are normal or dilated; Scudder,(50) that they are dilated and sluggish; and Hall's (18) summary of the signs of uremic coma includes "normal and equal pupils."

The findings in the coma cases in uremia are more uniform than in the other causes of coma. All the noted cases were either in mid-dilation or contracted; all presented some delay or entire fixation to the light reflex. In view of the majority of opinions in the literature that the pupils are unusually dilated in this condition, there undoubtedly must be an unreliable variation as to their size. There is nearly uniform agreement as to their sluggish reaction.

Cerebral Hemorrhage

Observations were made of 46 cases diagnosed as cerebral hemorrhage, 10 of which were verified by autopsy:

TABLE IV

Pupils in Coma of Cerebral Hemorrhage

Autopsied cases	10
Anisocoria	6
Size:	
Dilated	5
Mid-dilation	1
Contracted	3
Reaction to light:	
Prompt	0
Sluggish	1
Fixed	9
Cases not autopsied	36
Anisocoria	28
Larger on side of paralysis	13
Larger on opposite side of paralysis	15
Size:	
Dilated	4
Mid-dilation	10
Contracted	15
Not noted	7
Reaction to light:	
Prompt	5
Sluggish	20
Fixed	11

It is generally recognized that the pupils in cerebral hemorrhage are too variable to give much help in diagnosis. Such a view is held by Tooth,(55) Elsner,(11) Browning,(5) LeCount and Guy,(28) and many others. While there are many variations in the findings, certain features of the pupils in this condition are more constant than in almost any other form of coma.

Anisocoria: Inequality of the pupils occurred in 34 out of the total of 46 cases, or 73.9 per cent. This inequality is a feature which

has been noted by many writers and depends on the location of the hemorrhage. In those cases in which it is localized in the cerebrum there is usually dilation of the pupil of the same side; in the cases where it is located in the brain stem there is usually dilation of the pupil of the opposite side. However, the majority of hemorrhages occur in the cerebrum, and as a consequence the pupil of the same side is dilated. Special attention has been called to this so-called focal lesion, by many writers (Cumston,(9) Browning,(5) Adrogué and Balado,(1) etc.). In an important contribution to this subject, Köppel and Weil (24) observed a marked and persisting inequality of the pupils in about 40 per cent of all cases of cerebral hemiplegia. During the continuation of the coma, the pupil was contracted on the paralyzed side (on the opposite side of the cerebral lesion), but was dilated when the patient was not in coma. They regard the constriction during coma as depending upon the retardation of the affected hemisphere and the dilation after the cessation of the coma as depending upon an irritation of the hemisphere. This inequality of the pupils during coma does not argue against the acceptance of a cerebral hemorrhage, but weakens, under some conditions, the diagnosis of an hysterical hemiplegia. Koenig (25) reports 20 cases of a series of 72 cases of infantile cerebral paralysis, in which there was an inequality of the pupils with a normal reaction. In six of these there was either a mono- or a bi-lateral sluggish or absent reaction to light and convergence.

In the four cases of the present series with equal pupils which came to autopsy, one presented a diffuse intermeningeal hemorrhage; the second, a diffuse subarachnoid hemorrhage with both lateral ventricles filled; the third, a ruptured aneurysm at the base associated with a generalized subarachnoid hemorrhage, and the fourth, with an extensive left thalamic hemorrhage which had filled both lateral ventricles.

Size: The majority of opinion regards the pupils in cerebral hemorrhage as being most commonly dilated (Osler and McCrae,(44) Oppenheim,(43) Scudder (50), although here again the variation is so great that a rule of thumb is not reliable. In the present series more cases were contracted than dilated. The question of dilation or contraction depends entirely on the location of the lesion. If it is so located that it causes pressure on the nucleus of the third nerve, the pupils are contracted (hemorrhage into the pons or ventricles). In the present series certainly the majority are severe cases, and if judged by the autopsied cases the hemorrhage extensive. Conse-

quently it is probable that more of this series would show contraction than in cases in which there occurs only a monoplegia or a mild hemiparesis, and in which coma was not present, and the lesion relatively small.

Reaction: Oppenheim says that the pupils generally do not react to light, and Osler and McCrae, that they are always inactive in deep coma. Thomas, and also Gordon, state that during coma the light reflex is absent. Elsner modifies this opinion by stating that in the most serious cases the light reflex is abolished, while in the milder cases the reactions continue, although they may be abnormally sluggish. Of the total of 46 cases in the present series, 20, or 43.4 per cent, were fixed to direct light stimulation, while 21 others were distinctly sluggish. On the other hand, 5 reacted to light promptly, though not in every case through a normal arc.

Pontine Hemorrhage

The series includes five cases, two of which came to autopsy:

TABLE V

Pupils in Coma of Pontine Hemorrhage

Autopsied cases	2
Anisocoria	1
Size:	
Contracted	2
Reaction to light:	
Fixed	1
Sluggish	1
Cases not autopsied	3
Anisocoria (slight)	2
Size:	
Contracted	3
Reaction to light:	
Fixed	2
Sluggish	1

The pupils are characteristically contracted in pontine hemorrhage (Osler and McCrae,(44) Elsner,(11) Oppenheim (43)). They were contracted in all five of the present series, three of which were fixed and two very sluggish in the reaction to light. All of these cases were fatal, three with a temperature of 105° or over. Four presented crossed signs (paralysis of left face and right body) and one with a general flaccidity.

Carbon Monoxide Poisoning

In 43 cases of gas poisoning, which were in complete coma when the observations were made, the following status was found:

TABLE VI

Pupils in Gas Poisoning

Number of cases	43	
Anisocoria	4	9.7%
Size:		
Dilated	6	13.8%
Mid-dilation	22	50.6%
Contracted	15	34.5%
Reaction to light:		
Prompt	21	48.3%
Sluggish	5	11.5%
Fixed	17	29.1%

It will be noted that there is a marked variation in these cases both as to the size and the reaction. A large number of the cases with fixed pupils to light stimulation reacted following the regaining of consciousness. In the great majority of gas poisoning cases the history is usually known and consequently the pupillary status is of minor interest. No references were found in the literature regarding the pupils in this condition.

Fractured Skull

Under this heading might also be included a large group of cases who are admitted to the hospital in an unconscious state from head trauma due to cerebral concussion or even contusions of the skull, without skull fracture. However, for the sake of clearness in the conclusions, only cases of fractured skull, or probable fractured skull, are included.

The cases are divided into two groups: one, of 25 cases of proven skull fracture by palpation, roentgen-ray, operation, or autopsy, and a second group of 30 cases of probable skull fracture as evidenced by neurological signs, bloody spinal fluid, or bleeding from the ear, all of course with evidence of head trauma.

TABLE VII

Cases of Skull Fracture

I. Proven cases	25
(4 were conscious at the initial examination)	
Anisocoria	8
Size:	
Dilated	4
Mid-dilation	10
Contracted	9
Not noted	2
Reaction to light:	
Promptly	7
Sluggish	8
Fixed	10
II. Probable cases	30
(4 were conscious at initial examination)	

Anisocoria	13
Size:	
Dilated	7
Mid-dilation	4
Contracted	5
Not noted	14
Reaction to light:	
Promptly	10
Sluggish	5
Fixed	13
Not noted	2

Anisocoria: In the eight proven cases in which it occurred, the pupil on the side of the trauma was dilated in every case, at some period following the trauma. In the 13 cases of probable fracture in which anisocoria occurred, the dilated pupil was on the same side as the trauma in 9 instances and contre-coup in the other 4. It is necessary in these cases to watch the pupils closely to detect anisocoria, since it is often of a transient nature, being present in some observed cases only a few minutes. Its fleeting nature as well as the unilateral dilation as an aid in locating the lesion for surgical interference is stressed by Holman and Scott,(22) Hoessly,(20) and Brooks.(4)

Size of Pupil: A great variety of lesions may of course cause the variation in the size, and the latter will vary, depending on the status at a particular moment. There may be a mydriasis due to the temporary paralysis of the oculomotor nerve, which is more common than an irritation mydriasis (irritation of the cervical sympathetic). In the case of damage to the sphincter, sphincter nucleus, or efferent tracts, the result is mydriasis. These same lesions may apparently cause a myosis when they serve as an irritation or stimulation of the pupil contracting fibers of the third nerve. Thus any statistics as to the size of the pupils in skull trauma have little significance and are known to change frequently. It is more commonly contracted in these cases, which is stressed by Magitot,(33) which he regards as a spasm of the sphincter.

Reaction to the Light: In cases of skull fracture, there is a great deal of variation in the response to light, depending on the location of the lesion. Wilson (64) discusses the subject after classifying reported cases into those in which the injury occurred to the eye or behind it and those to traumatic lesions. He reviews eight cases of traumatic Argyll-Robertson pupils. Bumke (6) also discusses the question of pupil disturbances in trauma, depending on the location of the trauma.

The occurrence of a fixed pupil (Argyll-Robertson) as the result of trauma has received considerable discussion. It occurred 23

times in the 55 cases here reported in either one or both eyes. The possibility of active neurosyphilis was ruled out in practically every case by lumbar puncture. Fixed pupils have frequently been reported: Wilbrand and Saenger (62) briefly review 25 observations, 8 bilateral, 16 unilateral, and 1 beginning bilateral but finally resulting in unilateral fixation; Wilson (64) reviews 6 additional cases; Bumke (6) discusses 3 of those reviewed by Wilbrand and Saenger. Scudder (50) quotes Lovett and Monro that the pupils failed to react in 39 out of 59 fatal cases of basal fracture, and reacted in 11 out of 12 cases in which recovery occurred. Nichols records 54 cases of head injury with fixed pupils, 4 of which died.

It would appear from the observations made on the present cases that an unilateral dilation of the pupil is a frequent and important localizing sign, although this dilation may be contre-coup, and may be absent. It is often fleeting in its duration and must be closely watched for. The size varies, but perhaps is most commonly contracted. All stages of the response to light may be present and fixed pupils are a common occurrence. Their significance is difficult to interpret since they occur both with trauma to the eyeball as well as central lesions.

Summary

The pupillary status, including equality, size, and reaction to light, has been analyzed in 225 cases of complete coma.

1. In 58 cases of alcoholism, inequality occurred in a sufficiently large number of cases (13.8 per cent) to suspect it as more than an accidental occurrence. The majority of the cases were contracted (43.1 per cent) and nearly half (44.8 per cent) responded promptly to light stimulation, although another third (36.2 per cent) were fixed. It would appear that the pupils show too great a variation in this condition to be of much diagnostic importance.

2. In 10 cases of diabetic coma, there was no uniformity in the findings. Two cases of fixed pupils occurred, both of which terminated fatally.

3. In 8 cases of uremic coma, there seems to be a variation in the size, but the light reflex was impaired in varying degrees in every case, one of which was fixed. Inequality occurred but once.

4. In 46 cases of cerebral hemorrhage, nearly three-fourths (73.9 per cent) of them showed anisocoria. The dilated pupil usually occurs on the side corresponding to the hemorrhage, but this depends on the location and extent of the hemorrhage. There is no uniformity in the size of the pupils; in this series a slight majority were con-

tracted. Nearly half the series (43.4 per cent) were entirely fixed and 21 other cases (45.0 per cent) were distinctly sluggish.

5. In 5 cases of pontine hemorrhage, all were uniformly contracted, and either very sluggish or fixed to light stimulation.

6. In 43 cases of carbon monoxide poisoning, there is a marked variation in the size and the reaction to light. Just half (50.6 per cent) were in mid-dilation and about a third (34.5 per cent) contracted. Approximately half of the cases (49.3 per cent) reacted promptly although nearly a third (29.1 per cent) were fixed. It would seem that they have little diagnostic importance.

7. In 55 cases of fractured skull, inequality of the pupils occurred in over a third of the cases (37.8 per cent); in 81 per cent of these cases there is either proof or evidence that the dilatation occurred on the side of the brain trauma. In the remaining cases it is probable that the fracture was contre-coup from the point of trauma, and consequently the dilatation agreed with the side on which there was brain trauma. The inequality is recognized to be fleeting in many cases, and when observed is a noteworthy localizing sign for surgical intervention. The size varies at different stages and is not uniform. Not quite half the cases (41.4 per cent) were fixed to light and an additional 23.4 per cent were sluggish in reaction. Hence we may regard pupil fixation as a relatively common occurrence in skull trauma.

Conclusion

Pupils may be an aid in the diagnosis of comatous states when that state results from brain trauma (hemorrhage or pressure). They are of little or no diagnostic importance when the coma is due to alcohol poisoning, diabetes, uremia, or carbon monoxide.

BIBLIOGRAPHY

1. Adrogué, E., and Balado, M. The Pupils with Intracranial Hypertension. Prensa Méd. Argentina, 11:908–916, Feb. 28, 1925.
2. Barnes, F. M. Pupillary Disturbances in Alcoholic Psychosis. Bull. No. 3, Washington, 1911. Ref. in Neurol. Centralbl., 31:1515, 1912.
3. Biermann. Diabetes mit reflektorischer Pupillenstarre. Neurol. Centralbl., 31:1203, 1912.
4. Brooks, E. B. Significance of Unequal Pupils. J. A. M. A., 76:1145–1147, April 23, 1921.
5. Browning, W. Cerebral Hemorrhage, in Sajou's Analytic Cyclopedia of Practical Medicine. Philadelphia, F. A. Davis, 1914, Vol. III:92.
6. Bumke. Die Pupillenstörungen bei Geistes- und Nervenkrankheiten. Jena, V. G. Fischer, 1911, pp. 139, 242, 289.
7. Caille, A. Differential Diagnosis and Treatment of Disease. New York and London, D. Appleton & Co., 1906, p. 716.

8. Crothers, T. D. Alcoholism, in Sajou's Analytic Cyclopedia of Practical Medicine. Philadelphia, F. A. Davis, 1914, Vol. I, pp. 543, 545.
9. Cumston, C. G. Intracranial Hemorrhage. Internat. Clin., 27th Series, 3:99, 1917.
10. Cushney, A. R. A Textbook of Pharmacology and Therapeutics. Ed. 5. Philadelphia and New York, 1913, p. 138.
11. Elsner, H. L. In Monographic Medicine. New York and London, D. Appleton & Co., 1916, Vol. VI, p. 965.
12. Fischer. Über Beziehungen zwischen Tabes und Diabetes mellitus. Zentralbl. f. Nervenheilk., 1886, p. 545.
13. Fuchs, A. Über die Entstehung einer reflektorischen Pupillenstarre durch Methylalkoholvergiftung. Ztschr. f. Augenheilk., 42:50, 1919.
14. Fussell, M. H. Differential Diagnosis of Internal Diseases. New York and London, D. Appleton & Co., 1916 (Monographic Medicine Series, Vol. V), p. 709.
15. Gordon, A. In Tice's Practice of Medicine. New York, W. F. Prior Co., 1920, Vol. IX, p. 558.
16. Grube. Tabes oder Diabetes mellitus? Neurol. Centralbl., 14:5, 1895.
17. Gudden, H. Ueber die Pupillenreaktion bei Rauschzuständen und ihre forense Bedeutung. Neurol. Centralbl., 19:1096–1100, 1900.
18. Hall, J. N. Borderline Diseases. New York and London, D. Appleton & Co., 1915, Vol. I, p. 97.
19. Hatcher, R. A., and Wilbert, M. I. The Pharmacology of Useful Drugs. Chicago, A. M. A., 1915, p. 93.
20. Hoessly, H. Contraction of Pupil after Cerebral Injury. Mitt. a. d. Grenzgeb. d. Med. u. Chir., 30:1, 1919.
21. Holland, J. W. A Textbook of Medical Chemistry and Toxicology. Philadelphia and London, W. B. Saunders Co., 1906, p. 371.
22. Holman, E., and Scott, W. M. J. Significance of Unilateral Dilation and Fixation of Pupil in Severe Skull Injuries. J. A. M. A., 84: 1329–1332, May 2, 1925.
23. Hunt, E. L. Diagnostic Symptoms in Nervous Diseases. Philadelphia and London, W. B. Saunders Co., 1914, p. 167.
24. Klippel, M., and Weil, M. P. L'inegalité pupillaire au cours de l'hémiplégie cérébrale. Sémaine Méd., 32:541–544, 1912.
25. Koenig. On pupillary anomalies in paralyzed and nonparalyzed Idiot Children and Their Relation to Hereditary Syphilis. J. Ment. Sc., 46:427, July, 1900.
26. Kramer. Inaug. Dissert. Breslau, 1902.
27. Leber. Spinale Miosis. Virchow—Hirschs Jahresbericht, 2:544, 1879.
28. LeCount, E. R., and Guy, C. C. The Clinical Differentiation of Spontaneous Intracerebral Hemorrhage and Uremia. J. A. M. A., 85: 2003–2005, Dec. 26, 1925.
29. Lewis, B. G. A Reference Chart of Pupillary Symptoms of Diseases. American Encyclopedia and Dictionary of Ophthalmology. Chicago, Cleveland Press, 14:10603, 1919.
30. Liebers. Ein Fall von Diabetes mellitus mit Komplizierender Kleinhirnerkrankung. Münch. med. Wchnschr., 52:145–146, 1905.
31. Lundsgaard, K. K. K. On Night-Blindness and Other Eye Complications in Chronic Alcoholists. Acta Ophth., 2:112–124, 1924.
32. Maas, O. Zur Bewertung der reflektorischen Pupillenstarre. Neurol. Centralbl., 32:958–963, 1913.
33. Magitot, A. Variations in the Pupils after Ocular Injuries and Argyll-Robertson Signs in Injuries. Ann. d. Ocul., 155:228, 1918.
34. Mees, R. Über alkolische reflektorische Pupillenstarre. Münch. med. Wchnschr., 60:1200–1202, 1903.
35. Menninger, K. A. Alcoholic Argyll-Robertson Pupil? Alcoholic Psychosis Simulating Neurosyphilis. Am. J. Syph., 3:231–234, April, 1919.

36. Menninger, W. C. The Frequency of Pupil Anomalies in General Medical and Surgical Cases. Jour. Kansas M. Soc., 26:282–286, September, 1926.
37. Menninger, W. C. Unilateral Argyll-Robertson Pupil with Presence of Consensual Reaction in Both Eyes. J. N. & M. D., 63:58–60, January, 1926.
38. Moeli. Weitere Mittheilungen über die Pupillen-Reaction. Berlin, Klin. Wchnschr., 34:373–376, 401–405, 1897.
39. Nonne. Quoted by Wilbrand and Saenger, page 206. Ref. given Neurol. Centralbl., 34:254, 1915.
40. Nonne. Ein Weiterer Fall von alkologener reflektorischer Pupillenstarre. Neurol. Centralbl., 34:254–257, 1915.
41. Nonne, M. Über die sogen. myotonische Pupillenbewegung. Neurol. Centralbl., 21:837, 1902.
42. Oppenheim, H. Beitrage zur Pathologie der "multiplen Neuritis" und Alkohol—Lähmung. Ztschr. f. Klin. Med., 11:232–262, 1886.
43. Oppenheim, H. Textbook of Nervous Diseases. Translated by A. Bruce. London, T. N. Foulis, 1911, Vol. II, p. 797.
44. Osler, W., and McCrae, T. The Principles and Practice of Medicine. Ed. 9. New York and London, D. Appleton & Co., 1920, p. 387, p. 991.
45. Pick, A., and Hecht, A. Clinical Symptomatology. Translated by K. K. Koessler. New York and London, D. Appleton & Co., 1911, p. 725.
46. Purves-Stewart, Sir James. Acute Drunkenness, Medico-Legal Aspects, Symptoms, and Tests. Lancet, 1:111–115, Jan. 17, 1925.
47. Purves-Stewart, J. The Diagnosis of Nervous Diseases. New York, E. B. Treat & Co., Ed. 6, 1924, p. 171.
48. Retzlaff, K. Die diagnostische Bedeutung der Pupillenstarre und der Pupillenträgheit für die Erkennung von Nerven- und Geistes-Krankheiten. Inaug. Dissert., Berlin, 1907.
49. Rolleston, H. D. Alcoholism. In a System of Medicine. Edited by Allbutt and Rolleston. London, Macmillan & Co., 1909, Vol. II, Part i, p. 912.
50. Scudder, C. L. The Treatment of Fractures. Ed. 9. Philadelphia and London, W. B. Saunders Co., 1923, pp. 36–37.
51. Senator, H. In Nothnagel's Encyclopedia of Practical Medicine, American Edition. Volume on Kidney and Spleen and Hemorrhagic Diseases. Philadelphia and London, W. B. Saunders Co., 1905, pp. 96–98.
52. Siemerling. Ueber die Veränderungen der Pupillenreaktion bei Geisteskranken. Berlin. Klin. Wchnschr., 15:942–944, 1896.
53. Stapel, F. Das Verhalten der Pupillen bei der akuten Alkoholintoxikation. Alcoholversuche mit psychisch Gesunden und Minderwertigen. Monatschr. f. Psychiat. u. Neurol., 29:216–236, 1911.
54. Thomsen. Zur diagnostischen Bedeutung der Pupillenphänomen, speciell der reflektorischen Pupillenstarre bei Geisteskranken. Charité Annalen, 11:339–362, 1886.
55. Tooth, E. H. Haemorrhage in System of Medicine by Allbutt and Rolleston. London, Macmillan Co., 1910, Vol. VII, p. 322.
56. Uhthoff, W. Zur diagnostischen Bedeutung der reflektorischer Pupillenstarre. Berlin. Klin. Wchnschr., 23:36–40, 54–56, 1886.
57. Vogt. Ueber die Wirkung des Alkohols auf die Veränderung der Pupillenreaktion. Berlin. Klin. Wchnschr., 42:322–325, March 20, 1905.
58. Weber, L. W. Zur prognostischen Bedeutung des Argyll-Robertsonschen Phänomens. Monatschr. f. Psychiat. u. Neurol., 21:271–273, 1907.
59. Weilers. Quoted by Wilbrand and Saenger, p. 209.
60. Wernigk, B. von. Inaug. Dissert. Erlangen, 1887. (Quoted by Wilbrand and Saenger, p. 224.)

61. Westphal, A. Über einen Fall von vorübergehender reflektorischer Pupillenstarre nebst anderen Erscheinungen von seiten des Nervensystems bei Diabetes mellitus (mit anatomischer Untersuchung). Neurol. Centralbl., 36:514–520, 1917.
62. Wilbrand, H., and Saenger, A. Die Neurologie des Auges. München and Weisbaden, J. F. Bergmann, 1922, Vol. IX, pp. 205–210.
63. Wilson, J. C. Alcoholism. In System of Practical Medicine, edited by Wm. Pepper. Philadelphia, Lea Brothers, 1886, Vol. V, p. 637.
64. Wilson, S. A. K. Some Problems in Neurology. I. The Argyll-Robertson Pupil. J. Neurol. and Psychopath., 2:1–25, May, 1921.

BLOOD GROUPS IN MENTAL DISEASES*

By Frederick Proescher, M.D., and A. S. Arkush, A.B.

AGNEW STATE HOSPITAL, AGNEW, CALIFORNIA

When Landsteiner in 1901 (1) discovered the so-called "isoagglutinins" his discovery was considered merely as an interesting scientific fact without practical application.

Moss,(2) von Dungern and Hirszfeld,(3) Ottenberg,(4) Lattes,(5) and others apply the phenomenon of isoagglutination for selecting proper donors for blood transfusion, for solving anthropological, medico-legal and constitutional problems.

Hirszfeld,(6) and his co-workers have made most important studies concerning the relation of the blood groups to diseases. They have shown for example, in diphtheria, that the immunity for this disease is not connected with a certain blood group, but inherited together with the group. Other investigators have tried to connect malignant tumors (7) and mental (8) diseases with certain blood groups, but so far without definite results.

When we attempt to determine the cause for the existence of immunity or susceptibility in certain individuals; when we try to find a practical explanation for the biological varieties in mankind, we naturally look for aid to the principles of evolution and racial adaptation. If this is justified it becomes desirable to recognize the specific types and to do this we resort to the use of various indices. Thus we attempt to relate biological reactions on the one hand, with anthropological measurements, chemical reactions, blood groups, facies, complexion, etc. on the other hand. It is evident that the index of greatest value will be that which most accurately and conveniently separates into practicable groups the members of the human race. The index is a reflector of nature. The results of the Hirszfelds and others indicates that blood groups may, for some purpose at least, fulfill the requirement quite well.

In the following we wish to report our findings on the distribution of blood groups in mental diseases. In order to make this clear,

* From the Pathological Laboratory, Agnew State Hospital, Agnew, Calif.

a brief review of our present knowledge of the blood groups and the main facts about the phenomenon of isoagglutination will be given.

Isoagglutination

When a homogenous emulsion of red cells is mixed with the serum from another individual of the same species and prompt clumping takes place, this phenomenon is known as isoagglutination. Under certain conditions the agglutinated red cells may be hemolyzed (isohemolysis) as definitely shown by Mino.

Ehrlich and Morgenroth demonstrated by immunization of animals with blood of the same species differences in the blood structures. The serum of an animal immunized with his own blood or blood from another one of the same species possessed agglutinative or hemolytic properties for the blood of some animals of the same species.

Similar differences were noted in the blood of human beings at about the same time by Shattuck and Greenbaum and were mistakenly supposed to be the result of disease.

Landsteiner in 1901 made the first correct interpretation of the phenomenon and showed that it is not due to disease, but is a normal occurrence following a definite invariable law. From his observations he concluded the existence of three blood groups.

Jansky in 1907 (9) and Moss in 1910 discovered the fourth group, which escaped Landsteiner's observations, because of its rarity.

Decastello and Sturli, von Dungern and Hirszfeld, confirmed Landsteiner's, Jansky's, and Moss's observations that all human beings, relative to their blood, can be divided into four groups.

According to Landsteiner the human blood has two properties. One is anchored onto the red cells; the other is found in the serum. They do not react on the same blood. If we designate the serum properties as Anti A and B (antibodies against heterologous blood cells which have the properties of an antigen) and the red cell properties as a and b, we have the following:

TABLE I

	Group I	Group II	Group III	Group IV
Serum contains	Anti A-B	Anti B	Anti A	O
Red cell contains	O	a	b	a-b

Agglutination takes place only when Anti A with a or Anti B with b act together as shown in the following:

TABLE II

				Erythrocytes of group	
		I O	II a	III b	IV a-b
Serum I	Anti A-B	—	+	+	+
Serum II	Anti B	—	—	+	+
Serum III	Anti A	—	+	—	+
Serum IV	O	—	—	—	—

The fundamental work of von Dungern and Hirszfeld (10) in 1910 proved beyond doubt the inheritance of the blood structure or specific substances according to Mendel's Law. These investigations were based on the examination of the families of professors of the University of Heidelberg.

Von Dungern and Hirszfeld gave the following rules for the inheritance of the blood properties:

I. The blood properties may be inherited, but not necessarily.
II. Blood properties not present in either of the parents are not found in the blood of their offspring.
III. The properties a and b may be independently inherited. If, for example, the parents belong to group ab the children may belong to the group a, b, or ab.

Decastello and Sturli (11) have shown that in embryological development the specific agglutinogen or agglutinability of the red cells appears first and is usually present at birth (von Dungern found it in a six months old embryo) while the agglutinins, which are agglutinative properties of the blood serum, may be present at birth, but usually appear several months later. In rare instances they may not be observed for several years. According to W. M. Happ (12) the group is usually established by the first year and after two years is as fully developed as in adults.

All workers agree that group specific substances are permanent throughout life for each individual. It is true that there are investigators as Eden,(13) and Diemer (14) who believe that the blood groups can be changed by drugs, roentgen rays, narcosis, electric current, etc., but K. Nather,(15) Meyer and Ziskoven,(16) Jervell,(17) Mino,(18) Hoche and Mortisch (19) could not confirm their findings and opinion is very much one-sided. A change in the group specific substances could not be demonstrated by the above agents.

Distribution of Blood Groups in Human Races

During the world war L. & H. Hirszfeld (20) made important investigation as to the distribution of certain blood groups in human

races. They grouped Germans, French, English, Italians, Serbs, Greeks, Arabs, Roumanians, Turks and other Mohammedan races, Russians, East Indians, Negroes, Anamites and Jews. Likewise Halber and Mydlarsky (21) examined Poles, Polish Jews; Verzar and Weszeczky,(22) Ungars, German settlers in Ungary and Gypsies; Liu Heng and Wang,(23) Chinese; Fukamachi,(24) Koreans and Japanese; Terbut and Connel,(25) Australians; Coca and Deibert,(26) American Indians; Harvey Pirie,(27) South Africans; Schuetz and Woehlisch,(28) the North German population in Holstein and the adjacent islands.

These investigators demonstrated the presence of all four groups in every human race, but in different percentage distribution. L. and H. Hirszfeld found that agglutinogen A (antigen of the red blood cells of Group II) predominates over B in the races in Northern Europe and agglutinogen B (antigen of the red blood cells of Group III) predominates in Asia and Africa. In certain intermediate races A and B are about equally divided. The ratio of the percentage of A to that of B they called "racial index" and classified the population on this basis. Races with an index of more than two were assigned to the European type, with an index of less than one to the Asiatic type and with an index of between one and two to the "intermediate type."

L. and H. Hirszfeld advanced the hypothesis that A and B had different points of origin and made the assumption of two different biochemical races; one race (A. Group II) should have its origin in North and Middle Europe while the other had its nucleus in Asia. Through wandering and intermingling of the various races the present geographical distribution of the four groups has come about.

This classification of the Hirszfelds' is inadequate since they entirely disregard Group I. Since their investigations a large amount of material has been collected which differs considerably in the percentages of its tables. Hence the "racial index" is not sufficient for future classification.

Ottenberg (29) has regrouped the entire material so far available to 1925. He placed together those races which resemble each other in percentage of the different blood groups. According to his classification the races so far grouped seem to fall into six strikingly different types; the European, intermediate, Hunan, Indo-Manchurian, Afro-South, Asiatic and Pacific American type. This classification is at present the most logical and shows that no two types are alike, that the individual races of each type closely resemble each

other in their percentage distribution, and demonstrates a most striking geographical relationship.

The original classification of the Hirszfelds' and Ottenberg's new table are only tentative until we have more complete data on all the races. For further detail we refer the reader to Ottenberg's interesting article.

No matter which classification one accepts, so much is certain, that in all future statistical investigations dealing with blood group conditions the percentage distribution of the groups peculiar to the races investigated must be considered.

Correlation of Blood Groups to Constitution and Disease

When the constancy of blood groups in individuals became known, it was of interest to investigate the existence of a relationship between blood groups, size, weight, constitutional type, skin, and hair color. Alexander,(30) for example, sought to demonstrate that individuals belonging to Group I & III are more liable to succomb to malignant tumors, especially carcinoma, than members of the other groups. However Cavalieri,(31) Dossena and Lanzara,(32) Buchanan and Higley,(33) as well as Hoche and Mortisch,(34) have shown on a much larger scale that such a relation does not exist.

The latest investigations of L. & H. Hirszfeld with diphtheria have shown that the isoagglutinins have no direct relationship to diseases. Individuals of all groups may be either susceptible or immune to diphtheria (Schick negative or positive), but indirectly there exists a correlation between the isoagglutinins and the natural immunity against diphtheria. The ability to produce normal diphtheria antitoxin is coupled onto the blood group and inherited with it. In other words if the parents belong to different blood groups and if one of the parents is Schick positive (diphtheria susceptible) and the other Schick negative (diphtheria resistant) the children with the group of the positive elder are positive while the group of the negative elder are mostly negative and very rarely positive.

In malaria similar conditions were found by Ljachometzky.(35) The clinical course of the disease according to this investigator varies with the different blood groups.

Under Hirszfeld's (36) supervision correlation between blood groups, skin diseases and positive Wassermann reaction was obtained. For instance the rapidity with which the Wassermann reaction disappears in different individuals under specific treatment is coupled with certain blood groups. As found in Poland, individuals

belonging to Group O become Wassermann negative in a shorter time than individuals belonging to Group AB. There are considerable differences; the Group AB is 2.4 more positive than the Group O. In what respect the clinical course of syphilis is dependent on the union with one of the four blood groups, further investigations have to show. We do not deal here with the direct biochemical affinity with a pathological noxis; for example, diphtheria with a certain blood group is only an accidental coupling of the disease, disposition and chance genes for the respective blood group. Hirszfeld believes this is due to the close correlation of the respective chain gene in a chromosome, according to the well known investigations of Morgan. If this assumption is correct, the mechanism of the connection between diseases, disposition and blood group is satisfactorily explained.

Technique of Agglutination

It may not be amiss to give a brief description of the technic of agglutination for those who like to apply the grouping for constitutional investigations.

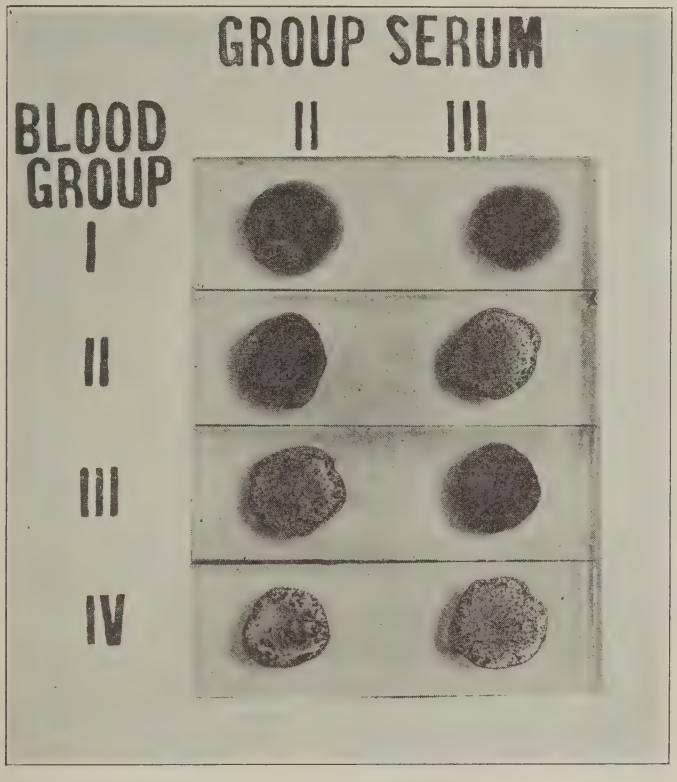
In spite of the simplicity of the test one has to be acquainted with the sources of error or false and misleading results will be obtained.

For grouping large numbers of individuals the open slide method of Vincent,(37) is the method of choice. A drop of serum II and a drop of serum III are placed on the left and right ends respectively of a perfectly clean slide. About ⅓ of a drop of blood from finger or ear is added to each drop of serum using a clean glass rod for each transfer. After thoroughly mixing blood and serum the slide is gently agitated for several minutes. If agglutination takes place it usually occurs from 1–10 minutes at room temperature and will be evident to the unaided eye as a granular or brick-dust appearance of the drop. The microscope should not be used for observing the agglutination.

Roulleaux formation is often confusing and frequently interpreted as agglutination. Genuine agglutination is always visible macroscopically. Before reading the results the slide should be thoroughly agitated or the blood stirred with a clean glass rod in order to exclude simple settling of the cells. This is one of the most common sources of error. Compactly settled cells may resemble massive agglutination but thoroughly mixed cells make a homogenous emulsion.

The following table will give a photographic reproduction of the macroscopic agglutination test for blood groups:

TABLE III



The sera used for grouping must be of the correct groups and highly potent or errors, particularly in overlooking Group IV cases will occur. Each serum before it is accepted for use should be titrated against several sera of Groups II and III since sera from individuals of the same group vary in their agglutinative power. Likewise the corpuscles from different individuals of the same group vary as to their agglutinability by the same serum. Only those sera should be used which show agglutination up to a dilution of 1–10 since their potency gradually diminishes, no matter how they are preserved. Some deteriorate in a few weeks while others may keep for months or even years. Two precautions are especially important for reliable work:

1. Test sera must be potent at the time of the test.

2. Each test should be duplicated with two different sera of Groups II and III.

As mentioned above, isohemolysins may be present but never without the corresponding agglutinins. If complete hemolysis takes place and it is easily recognized, it is equal to agglutination in labelling the group. Hemolysis can be prevented if the serum is inactivated and the red cells washed, or if the test is done at ice box temperature. This should be done in case of incomplete hemolysis and weak agglutination where both phenomena obscure each other.

The exceedingly rare phenomenon of autoagglutination may be briefly mentioned as a source of error. It is observed only at low temperature and easily ruled out if a control of the red cell emulsion in saline solution, or better, with a drop of the patient's own serum is made.

Blood intended for the preparation of the group serum should preferably be taken under sterile precautions. After the serum is tested for potency it may be transferred in quantities of 3–5 c.c. into small ampules and sealed. To prevent clotting of the blood to be tested the addition of 1 per cent sodium citrate to the group serum is advisable. The increased salt concentration seems to act as an accelerator for the agglutination. We have never observed a non-specific agglutination caused by the addition of the 1 per cent sodium citrate.

Blood Groups in Psychoses—Statistical Study *

All patients in the Agnews State Hospital ‡ for the insane were grouped. This included 1,525 cases. Following this, selected cases were grouped at various times at Agnew and other state hospitals.† These selections always included the psychoses of dementia precox, progressive paralysis, depressive mania and epilepsy, though the females of some of these groups were occasionally omitted. These four psychoses furnish the bulk (5/6) of the patients and of our statistics. The original group, however, in which all cases were examined, permits the formulation of ratios involving the rarer

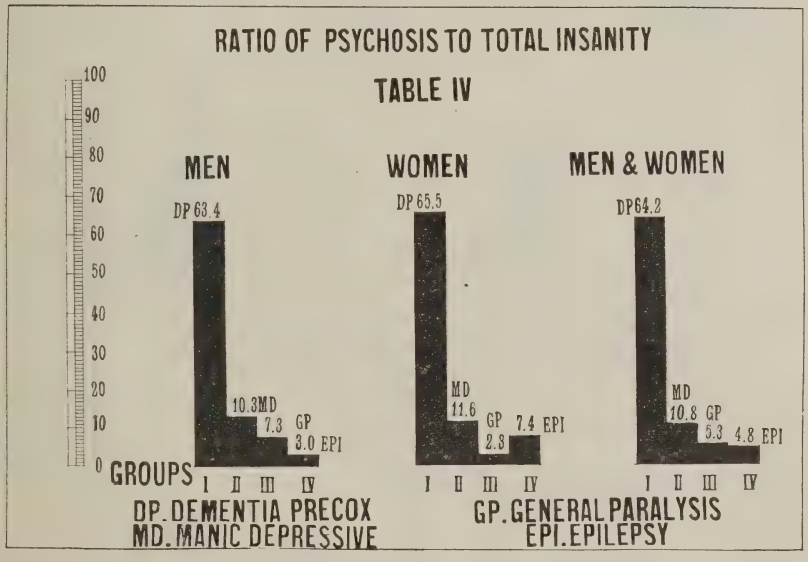
* The reader is cautioned that group numbers in this article follow the Jansky and not the Moss system. Groups I and IV are interchanged in these two systems, Group I being the universal donor group in the Jansky nomenclature.

† The authors take the opportunity to thank these institutions for their coöperation.

‡ We are in debt to Mr. Wilbur Bailey who grouped the majority of the patients in the Agnew State Hospital.

diseases. It is felt that percentages based upon the few individuals in the rarer psychoses would be misleading. These are therefore omitted in what follows. It is unfortunate that all cases at all of the hospitals visited could not be examined, though the results appear convincing. Whenever possible the figures for all cases recorded have been used, though the restrictions and limitations imposed by the facts noted above should be remembered. Two thousand, one hundred and four cases in all were examined and assigned blood groups.

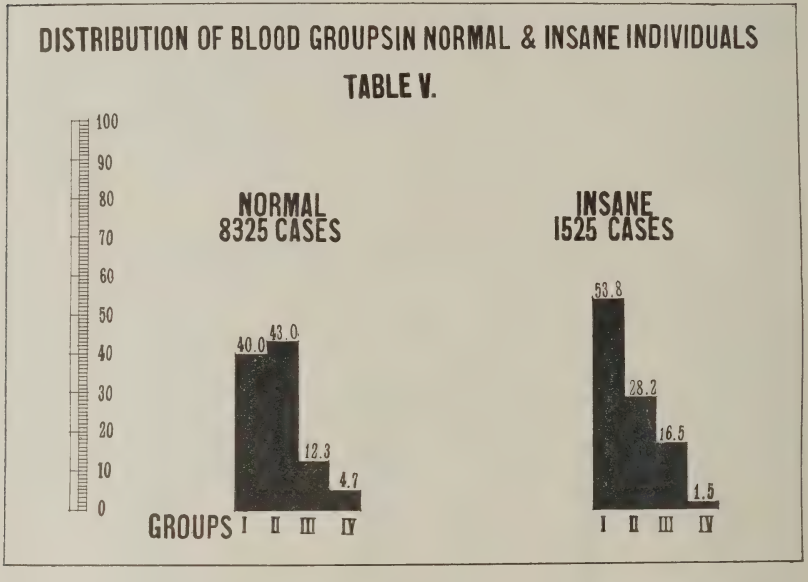
Before attempting a consideration of blood groups it seems desirable to know approximately how the various psychoses are distributed among the list of patients. These values, based on the 2,104 cases plus a proportionate amount for rare types as derived from the original group, are given in Table IV.



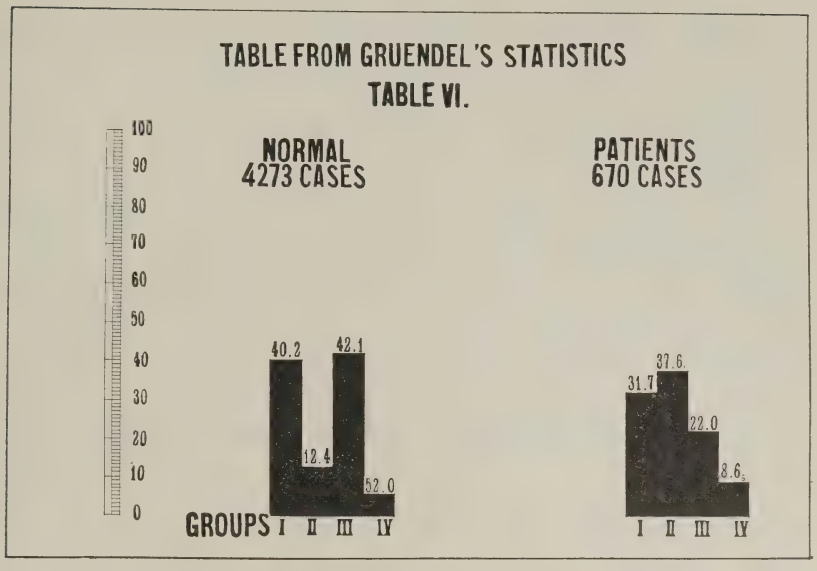
The close correspondence in findings for male and female patients will be noted here. This is true throughout and leads to the conclusion that such differences as exist are within the laws of chance, and that the laws of incidence of insanity, whatever they may be, apply equally to each sex (except for relative susceptibility between males and females which is not indicated by our data). In future tables separation of the sexes will therefore be omitted.

In order to discover what peculiarities in distribution of blood types occur in mental diseases, it becomes necessary to establish a

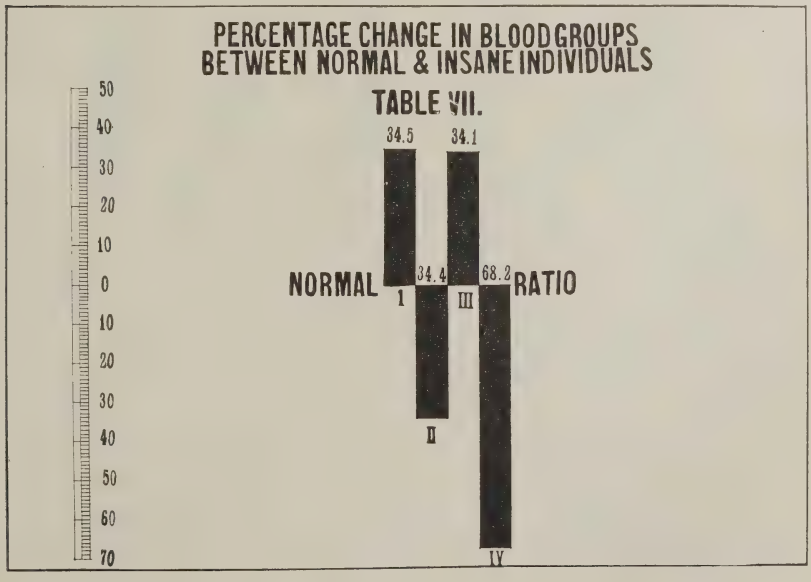
normal distribution. To do this, averages have been taken from the first type (European) as given by Ottenberg in his classification. This type was selected as it probably represents most accurately the people of the state of California. Such a percentage distribution of blood groups for normal individuals is shown in Table V in which is also placed for comparison the percentage distribution for insane persons as determined from our data.



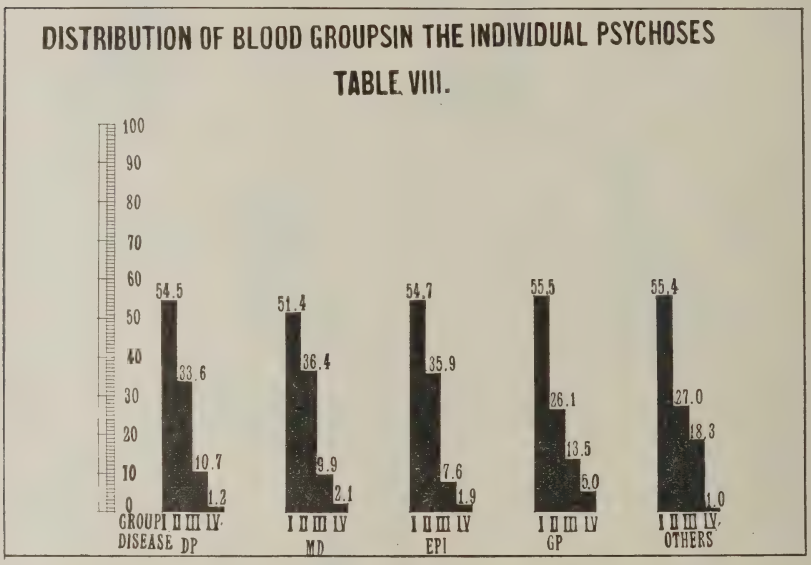
Gruendel has recently compiled figures similar to these based on normal individuals and persons visiting a clinic for organic nervous diseases (not psychotic). A table similar to Table V and prepared from his statistics follows:



Such figures as these, while indicating qualitative changes, do not readily convey the practical facts because the change should be considered in proportion to the original value. Thus the shift in Group I distribution of 13.8 per cent is, not more, but exactly the same as the Group III change of only 4.2 per cent.



From Table VII we see that, in psychoses, the increase in Group I by percentage is exactly the same as that in Group III and each is equal to the decrease in Group II and to ½ the decrease in Group IV. Expressed in another way we may say that the chances for normal individuals of blood groups I, II, III, and IV to develop a psychosis is in the ratio 4:2::4:1 respectively. This we interpret to mean that the chances or liability for normal members of blood groups I and III to develop a psychosis is equal and twice as great as for members of Group II and four times as great as for members of Group IV. *The susceptibility of the members of the various blood groups to insanity differs and is in definite ratio.**



This Table (VIII) includes all of the data taken. A striking similarity between each of the groups is at once noted. This leads to the following conclusion: *Distribution of blood groups is constant in mental diseases regardless of the psychosis.* Comparison with Table V shows that the distribution of blood groups in each disease is

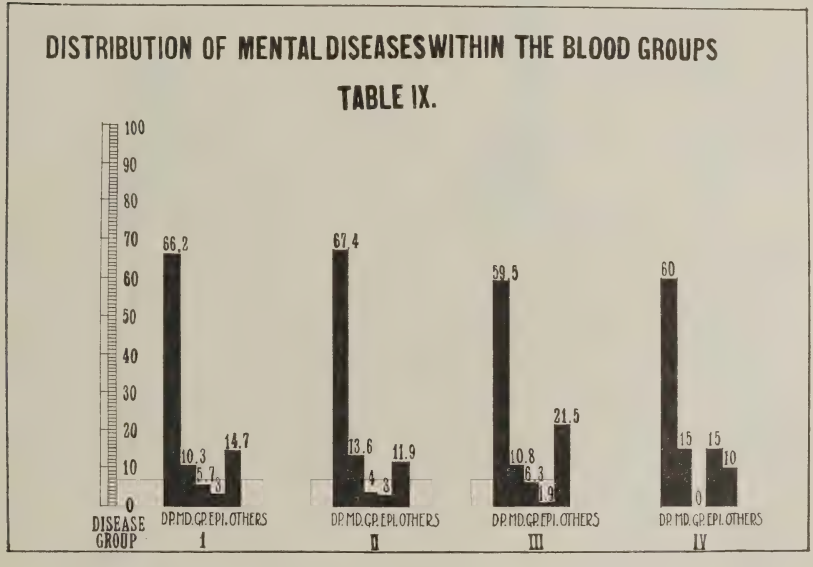
* This may be more readily understood mathematically if we derive our relative liability values for the blood groups from Table VII figures, as follows:

For Group I	53.8/40	equals 1.345
For Group II	28.2/43	equals .656
For Group III	16.5/12.3	equals 1.341
For Group IV	1.5/4.7	equals .319

Summarizing: 1.345 : .656 :: 1.341 : .319 equals 4 : 2 :: 4 : 1.

the same as that for insanity in general which, in turn, has been shown to differ from normal distribution only in susceptibility to insanity in general.

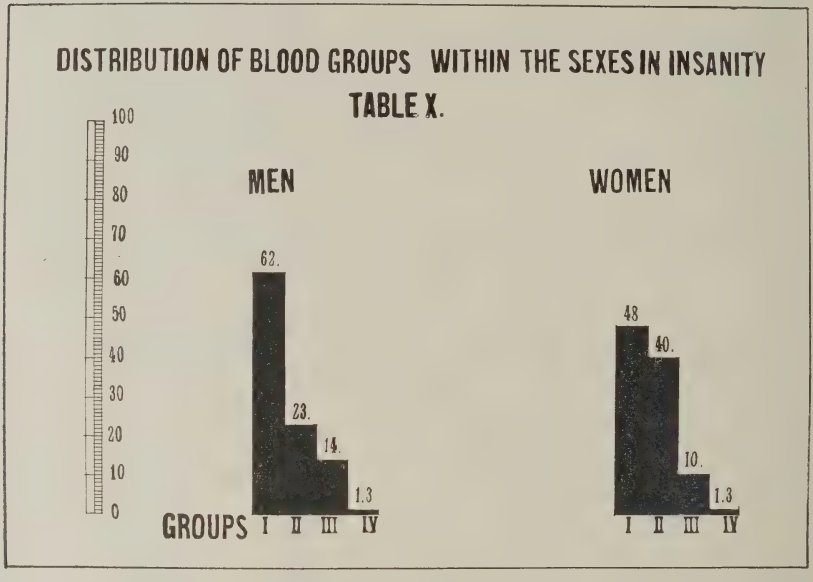
One of the main objectives of this study has been the establishment of a relationship of blood groups to mental diseases as the basis for a chart of liabilities or susceptibilities, this chart to be used in the diagnosis of prospective patients. Thus we discovered above that the liability of the normal individual to mental diseases varies with the blood group. We may further ask: (1) What is the relative susceptibility of normal individuals to mental diseases, and (2) What is the relative liability of insane individuals of the respective blood groups to these psychoses? If a peculiar distribution exists within each group, such a liability chart may be constructed to good advantage. It was with this end in view that Table IX was constructed.



Such a table (IX) is discouraging in so far as the objective just named is concerned for it shows that *within each blood group there is practically a constant distribution of patients among the various psychoses.* Group IV comprises so few cases (about 1.5 per cent) as to readily account for its deviation.

In spite of what has been said concerning sex there seems to be a general tendency on the part of females to even the distribution in Groups I and II. It has been thought best to show this separately in Table X and to leave the question open as to whether or not sex

factor is concerned in the incidence through heritage or susceptibility to insanity. It must be appreciated that, to some extent, social and economic factors will further tend to distort these relationships, but the delineation of such factors is beyond the author's scope and probably would not influence the essential conclusions.



It will be marked that any value which may lie in these statistics or conclusions drawn from them will depend to a very considerable extent upon the accuracy of diagnosis in the various institutions. It is therefore desirable to attempt a correlation of results obtained from individual hospitals. If close correlation exists it will be assumed that their diagnoses are similar and accurate. Table XI gives such a comparison. Only tables involving considerable numbers of patients are used.

TABLE XI*

Correlation of Institutions

Group	I	II	III	IV	I	II	III	IV	I	II	III	IV
Agnew S. H...	54	28	17	2	57	32	11	1	67	11	5	3
Stockton S. H.	51	37	11	2	48	42	12	2	66	6	..	..
Napa S. H....	52	35	12	1	52	32	15	1	58	..	..	..
Patton S. H...	50	38	10	2	51	40	9	1	58	16	..	3
Ratio:		A				B				C		

* Ratio A is No. in blood group/Total insanity (similar to Table V).
Ratio B is same, but for dementia precox only.
Ratio C is No. in psychoses/Total insanity (similar to Table IX).
Initials stand for State Hospital.
Blank spaces in the table are due to incomplete statistics.

Results from this table (XI) are fairly conclusive. In judging them it must be considered that of over 2,100 cases examined, only 312 were at Patton, 173 at Napa, 252 at Stockton, and all the remainder at Agnew. The correlation in Table IX therefore seems quite close.

Several general aspects of this subject occur to the authors as being worthy of notice. If we return to our evolutionary hypothesis of the development of blood groups we may picture a time long ago when no separation into races had occurred and all individuals were universal donors. The fetus passes through this stage to-day, just as in other respects it repeats, in rough form, its phylogenetic development. With this picture of the primitive universal donor in mind it would seem that the crudest and least highly developed of nervous systems might belong in general to Group I members. This more simple system with its more undifferentiated parts might be expected to be less susceptible to injury to those higher factors loss of which stigmatizes one as insane. In other words, Group I members should be least susceptible to insanity and this is actually the case. In this regard a comparison between psychologic rating (as reflecting racial development) and blood grouping (also reflecting racial development) would be of interest. The same might be said of blood groups and immunity in general.

There are a large number of persons who believe that insanity has no organic basis. Exactly how these individuals picture or explain the conditions in their own minds is difficult for the authors to understand. The latter submit, however, that such findings as these added to such facts as inherited insanity (or "susceptibility" to it) are strong indications for such an organic basis.

No conclusion as to the basis of insanity is possible from such data as given. There is a very definite suggestion, however, that it is fundamental and not ephemeral; it is a matter of race and structure and not of infection, caprice, or environment (though the power of environment to demonstrate or precipitate insanity is well known).

The authors believe that the negative results obtained, while disappointing from the point of view of their original purpose, obtainment of a diagnostic aid, are of considerable value. It should be noted that the findings given herein are in line with those of the Hirszfelds and Ljachometzky as noted above.

Summary of Indications from Data Collected

The character of a psychosis is neither determined nor indicated by the blood group, though the susceptibility is so indicated. Distri-

bution of blood groups in psychoses and in a specific psychosis is constant, as is also the distribution of the specific psychosis within the blood groups. Susceptibility of the four blood groups shows a constant ratio which differs from that of population and which may be expressed for Groups I, II, III, and IV as 4:2::4:1 respectively. These conclusions are drawn from the grouping of 2,104 cases from California State Hospitals for the Insane.

BIBLIOGRAPHY OF PRINCIPAL REFERENCES

1. Landsteiner. Wien klin. Wochenschr., 1901, p. 1132.
2. Moss. Bull. of Johns Hopkins Hosp., 21, 63, 1910.
3. Von Dungern und Hirszfeld. Muen. med. Wochenschr., 1910, p. 741.
4. Ottenberg. Journ. of immunol., 6, 363, 1921.
5. Lattes. Die Individualitet des Blutes, etc. Berlin, Julius Springer, 1925.
6. Hirszfeld und Brokman. Klin. Wochenschr., 1924, Nr. 29, p. 1308.
7. Johannses. Cpt. rend. des seances de la soc. de biol., 92, 112, 1925.
8. Dolter. Med. Klinik No. 36, Sept. 4, 1925.
9. Jansky. Kliniky Sbornik, 1906. Nr. 2, Folia Serol. 3,316. 1908.
10. Von Dungern und Hirszfeld. Zeitschr. f. Immunitatsforsch. u. exp. Therapie, Orig. 6, 284, 1910.
11. Decastello und Sturli. Muen. med. Wochenschr., 1902, p. 1090.
12. Happ. Journ. of exp. med., 21, 313, 1920.
13. Eden. Dtsch. med. Wochenschr., 1922, p. 85.
14. Diemer. Mitt. a. d. Grenzgeb. d. Med. u. Chirurg., 35, 464, 1922.
15. Nather. Wien. klin. Wochenschr., 37, 203, 1924.
16. Meyer und Ziskoven. Med. Klinik, 19, 91, 1923.
17. Jervell. Journ. of the Amer. Med. Assoc., 77, 1668, 1921.
18. Mino. Rif. med., 1923, p. 386.
19. Hoche und Mortisch. Mitt. a. d. Grenzegeb. d. Med. u. Chirurg., Vol. 38, 5, 1925.
20. Hirszfeld, L. and H. Lancet, 2, 675, 1919.
21. Halber and Mydlarski. Cpt. rend. des seances de la soc. de biol., 89, 1376, 1923.
22. Verzar und Weszeczky. Biochem. Zeitschr., 126, 33, 1921.
23. Liu Heng and Wang. Nat. med. journ., China, 6, 118, 1920.
24. Fukamachi. Journ. of immunol., 8, 291, 1923.
25. Terbut and Connel. Med. Journ. of Australia, 2, 201, 1922.
26. Coca and Deibert. Journ. of immunol., 8, 487, 1923.
27. Pirie. Med. Journ. of South Africa, 16, 109, 1921.
28. Schuetz und Woehlisch. Klin. Wochenschr., 1924, Nr. 36, p. 1614.
29. Ottenberg. Journ. of Amer. Med. Assoc., May 9, 1925, pp. 1393–1395.
30. Alexander. Brit. Journ. of Exp. Pathol., 2, 66, 1921.
31. Cavalieri. Arch. di patol. e clin. med., 1, 5, 1922.
32. Dossena and Lanzara. Ann. di osteter. e ginecol., 47, 163, 1925.
33. Buchanan and Higley. Brit. Journ. of Exp. Pathol., 2, 247, 1921.
34. Hoche and Mortisch. l. c., No. 19.
35. Ljachometzky. Dtsch. med. Wochenschr., 1924, Nr. 17, p. 558.
36. Amsel und Halber. Zeitschr. f. Immunitatsforsch. u. exp. Therapie, Vol. 42, 2.
37. Vincent. Journ. of Amer. Med. Assoc., 70, 1219, 1918.

ENDOCRIN AND BIOCHEMICAL STUDIES IN SCHIZOPHRENIA

By Karl M. Bowman, M.D.

ASSISTANT PROFESSOR IN PSYCHIATRY, HARVARD MEDICAL SCHOOL; CHIEF MEDICAL OFFICER OF THE BOSTON PSYCHOPATHIC HOSPITAL, BOSTON, MASSACHUSETTS

(Continued from page 483)

Conclusions

A study of twenty-four cases of schizophrenia was made, using tests which would have a special relationship to endocrin function. The following studies were made: A complete X-ray study, basal metabolism, blood sugar curve, galactose tolerance test, chemical and microscopic examination of the blood, Kottman test, spinal fluid examination, gastric analysis, renal function test, and cardioöcular reflex.

The following findings appear to be of significance: Abnormally low basal metabolism was found in half of the cases with a tendency towards low or minus readings in nearly all the other cases. Nearly one-half of the cases showed an abnormal blood sugar curve, all but one being of the "sustained" type. Over one-third showed a positive galactose test. X-ray examinations and gastric analyses showed a definite functional disorder of the gastro-intestinal tract in about half of the cases and questionable functional disorders in all but two of the other cases. X-ray examinations further revealed infected teeth in 40 per cent of the cases with questionable infection in 10 per cent more. X-ray examinations also revealed "dropped" hearts in 30 per cent of the cases, questionable pulmonary tuberculosis in 13 per cent and healed pulmonary tuberculosis in 4 per cent (one case).

The findings are not consistent with the constant presence of any definite endocrin disorder and do not suggest that a simple glandular disfunction of a constant type is an etiological factor in schizophrenia. Rather they suggest that many functional disorders, closely linked up with the endocrin system, are frequently found and that schizophrenia is not a specific endocrin disease but may arise on a number of different bases. The one constant finding appears to be that a metabolic disorder of varying degree is nearly always present as manifested in functional gastro-intestinal disorders and a tendency

towards low basal metabolism which are present in the majority of cases.

Credit is due to Dr. Jacob Kasanin for the work on the Kottman reaction, to Dr. Julia Deming for the studies on the cardioöcular reflex, to Miss Emily Knapp for the different chemical analyses and to the staff of the Boston Psychopathic Hospital in general for coöperation and assistance in this study.

Case Histories in Abstract

Case 1. A white female, twenty-two years old, single. Admitted October 9, 1924.

Family History: Mother is said to be nervous and excitable. Otherwise negative.

Personal History: Birth and early development were normal. She had measles when five years old. Was operated on for appendicitis when twelve. She finished high school at sixteen. Studied the piano with private teachers up until the time of admission. She taught music since she was sixteen but had few pupils as she was too independent and did not fit in with things. She has been self-supporting since nineteen.

Personality: Very sensitive, did not mix well with others, felt superior to her family. She would often sit alone day dreaming. Was of high intelligence. She was completely wrapped up in her music.

Onset of Present Illness: Her sickness has come on slowly and insidiously and no exact date can be given for its commencement. In the fall of 1922, two years prior to admission, she weighed over 130 pounds and went on a diet to reduce. She became very much attached to a poet and started fussing a great deal about her personal appearance. She commenced to complain of stomach trouble. She did not menstruate for five months preceding admission. Became greatly interested in religious matters. She assumed attitudes and talked in a queer way about having found God.

Mental Status: The patient laughed, sang, wept or was very quiet without apparent cause. She assumed dramatic poses. Her speech was frequently incoherent and she constantly brought up the topics of religion and sex. Her mood was variable. She had many vaguely formulated delusions. She said that she was the devil, that she had to save souls, etc. She had visual hallucinations in which she saw Christ throwing confetti about. Orientation and memory were impaired and she had little insight.

Physical Status: Sixteen pounds under ideal weight. Otherwise no noteworthy findings.

Progress: The patient became progressively worse while in the hospital. She would go into a stupor at times when she would wet and soil herself and have to be tube fed. At other times she would show

odd and impulsive behavior. She expressed a great many delusions of a religious and erotic nature. She was discharged on July 1, 1925, to the Danvers State Hospital as unimproved.

Case 2. A white female, thirty-six years old, single. Admitted February 7, 1925.

Family History: A number of members of the family are said to be rather high strung and sensitive but there have never been any definite mental or nervous diseases.

Personal History: Birth and early development were normal. She had measles, mumps and scarlet fever when a small child. She had a few convulsions when a baby. She was always considered somewhat sensitive and high strung. She bit her nails. During adolescence she had temper tantrums and crying spells. She finished three years work in college but developed pulmonary tuberculosis in 1913 and spent a year in Colorado. Four years later, when twenty-seven years old, she had an operation for appendicitis. She worked and studied irregularly as a social worker.

Personality: Was always extremely sensitive, high strung, and ambitious, chiefly interested in her studies.

Onset of Present Illness: No exact date can be given for the onset. Since the age of fourteen she had frequent spells of depression and tension. She had numerous physical complaints. She was a patient at Bloomingdale Hospital for two years, from June, 1919, to July, 1921, where she was diagnosed as psychoneurosis-neurasthenia and considered improved at the time of her discharge. In 1922 she was psychoanalyzed for three months and fell in love with the analyst. She commenced to feel that he was influencing her in a peculiar way. Several times she felt that an influence was suggesting that she marry some man. She felt that people imitated her on the street and this was caused by the analyst.

Mental Status: The patient was quiet and coöperative. She had spells of laughter which she, herself, felt had no cause. She had numerous ideas of influence and felt that peculiar forces were influencing her. She was correctly oriented, her memory and general information were satisfactory. She had practically no insight.

Physical Status: The patient was fifty pounds underweight and a few fine crepitant rales were heard at the right apex. Other findings were negative.

Progress: The patient's condition continued unchanged and she was discharged on June 5, 1925, as unimproved.

Case 3. A white female, seventeen years old, single. Admitted June 29, 1923.

Family History: Maternal grandmother had a psychosis coming on at the involutional period. She was very suspicious. Her psychosis

continued until her death thirty years later. The father is alcoholic and does not support his family.

Personal History: Birth and early development were normal. She finished the second year of high school when sixteen years old. She had measles and whooping cough as a child. On leaving school she worked in several clerical positions.

Personality: The patient has always been rather stubborn and irritable. Appeared to be quite self-satisfied.

Onset of Present Illness: Patient was always fat but took on a great deal of weight in the past few years. For six months or so preceding admission she became progressively irritable and showed a personality change. There is a vague history of some sort of fainting attack following an argument at about the time this personality change commenced. Patient would go to the movies clad only in underclothes, shoes and stockings and an overcoat. She neglected her personal appearance. One day she started to work in her nightgown.

Mental Status: Patient was quiet and well behaved. She admitted having had auditory hallucinations and explained that she went out with little clothing because the voices told her to do so. Her menstruation had started in the fifteenth year, was irregular and she had not menstruated for sixteen months. She said this made her feel as if she were of a different sex. There were some compulsive phenomena. She was correctly oriented. Memory and general information were satisfactory. There was little insight.

Physical Status: Height 5 ft. 2 inches. Weight 187 pounds. Complained of frontal headache, pains in abdomen and vomiting spells.

Progress: The patient was discharged from the hospital on visit October 13, 1924. She had been given thyroid extract and claimed that she felt better while taking it. She purchased thyroid extract and took fifteen grains a day for some time because she felt it would make her thin. She ate less. She had an attack of acute appendicitis and was operated on at the City Hospital. She commenced to have attacks of a peculiar nature. She would often vomit at the beginning of the attack, scream, and then lie as if unconscious. There was no biting of the tongue. There were no involuntary movements. She would eat little and often vomited immediately after a meal. She returned to the hospital on December 2, 1924, at which time she showed very much the same picture as at her first admission. She was a little more frank and acknowledged more abnormal ideas than previously. Following pituitary feeding in January, 1925, she started menstruating. She was later put on thyroid medication. Her weight at this time was 145 pounds. The patient would eat very little in a studied attempt to reduce her weight which dropped to 126 pounds after three months of five grains of thyroid daily. She was again discharged on visit on June 10, 1925.

She returned home and after a while secured a clerical position at which she is still working. She gets along poorly with her family.

Case 4. A white female, thirty-nine years old, single. Admitted January 26, 1925.

Family History: Mother is sixty-six, has diabetes. No history of any nervous or mental disease or defect obtainable.

Personal History: Birth and early development were normal. She had measles twice and jaundice when nine years old. She has always been subject to colds and had her adenoids removed when twelve. When a child she was struck on the left side of the head by a refrigerator cover. She finished high school when twenty. She took piano lessons from her eighth year and also studied the pipe organ. She gave piano lessons until June, 1922, being quite successful in her work. She was never given any sex information, never appeared interested in the opposite sex.

Personality: Very shy and modest, never mixed well with others, was fond of reading, especially history and travel. Her main interest was in her music.

Onset of Present Illness: There was probably an insidious personality change, starting about five years ago. The patient felt people were looking in at the windows, were talking about her and trying to injure her in her work. She fainted several times in church.

Mental Status: The patient was quiet and seclusive. Her delusions were quite well systematized. She felt that people were jealous of her, that they were trying to reveal her marriage, that white slavery was going on in the town, that people stole things from her and that poison was being put in her food. Auditory hallucinations were present. Her intellectual functions were well preserved.

Physical Status: Essentially negative.

Progress: The patient gradually became more antagonistic and more insistent in stating her delusions. She was discharged on July 15, 1925, to Foxboro State Hospital as unimproved.

Case No. 5. A white male, thirty-three years old, single. Admitted October 25, 1924.

Family History: The father was a heavy drinker, quick tempered and a spendthrift.

Personal History: Birth and early development normal. Has never had any serious illness. He graduated from grammar school and then started to work as a clerk in a drug store. After this he held several positions driving delivery teams and continued this up until the time of admission.

Personality: Devoted to his mother, very few friends, extremely religious, no bad habits.

Onset of Present Illness: There was a vague history of some sort of fall three years before admission but nothing to show that the patient sustained any injury. However, he stopped work at this time, started to worry about his mother and became very religious. He would allow no one to cut his hair and refused to shave. He prayed a great deal and fasted.

Mental Status: The patient was quiet, coöperative and in fair contact with his environment. He stated that he was Christ and the Incarnation of thirty-two Popes. He had visual and auditory hallucinations of a religious nature. He would not coöperate enough for tests of his intellectual functions.

Physical Status: The patient was quite thin and emaciated as a result of lack of food. There was a fine tremor of the tongue and extended fingers and he appeared to be a little weak.

Progress: The patient's condition continued essentially unchanged and he was discharged on June 10, 1925, to the Boston State Hospital as unimproved.

Case No. 6: A white female, eighteen years old, single. Admitted March 16, 1925.

Family History: Negative.

Personal History: Is a twin. Birth and early development normal and she was possibly a little more precocious than her twin brother. The patient was in the last year of high school at the time of her admission. During infancy she suffered from indigestion. She had measles, scarlet fever, whooping cough and chickenpox during childhood. When five years old she had a paracentesis. She had influenza when fourteen.

Personality: Always bright, cheerful, a good mixer with plenty of friends, a leader in social and athletic activities at school, very conscientious but not bashful or sensitive.

Onset of Present Illness: Six months before admission the patient seemed a little different. She did not speak to certain people for days, was rather fault finding. Two months before admission she became less cheerful. On February 21, 1925, she broke down at school and cried. She appeared confused. She was tube fed and was incontinent. She complained of abdominal pain and there was some rigidity of the right side. She was operated on February 25. Her appendix and two ovarian cysts were removed. After the operation she appeared greatly confused, she inserted articles up her vagina, seemed afraid that people knew things about her and talked constantly of a young man of her acquaintance.

Mental Status: The patient was usually underactive but occasionally became somewhat overactive. She often assumed rigid attitudes of a symbolic or dramatic nature. Her talk was fragmentary. She occasionally wept and occasionally appeared ecstatic. She talked in a self-

accusatory manner about love. She apparently had auditory hallucinations. She said that she was in Heaven.

Physical Status: Recently healed scar over the right rectus. Otherwise negative.

Progress: The patient gradually cleared up. She stated that she had felt that some mysterious force had been controlling her actions and that she had been having auditory hallucinations. She was discharged from the hospital June 17, 1925, and has apparently done well since then.

Case No. 7: A white female, thirty-four years old, single. Admitted April 18, 1925.

Family History: Unknown.

Personal History: Little known of her birth and early development but she was thought to have been normal as a small child and not to have had any severe sicknesses. She finished grammar school when about fifteen. She has been doing housework ever since leaving school.

Personality: Very quiet, sensitive, has no friends and is not sociable, is fond of reading books about beautiful homes and rich people, prayed a good deal, took religion very seriously.

Onset of Present Illness: Four days before admission the patient called up her cousin and said that people were following her and that something very peculiar was going on. She said that people were trying to poison the doctor at the home where she worked.

Mental Status: The patient was underactive, appeared cheerful, had numerous delusions which were rather ill defined and vague that trouble was going on and that people were watching her. No hallucinations were elicited. She was correctly oriented. Memory and general information were satisfactory. There was slight insight.

Physical Status: About ten pounds underweight. Fine tremor of fingers. Knee jerks hyperactive.

Progress: The patient became more underactive and had to be tube fed at times. She often appeared rather dazed. She was discharged on October 27, 1925, to Danvers State Hospital as unimproved.

Case No. 8. A white female, thirty-two years old, married. Admitted July 30, 1924.

Family History: Negative as far as could be ascertained.

Personal History: Birth and early development were normal. Diphtheria when a small child is the only severe illness she has ever had. Her mother died when she was eleven and she lived in private families until nineteen, getting along very well. She finished the second year of high school when sixteen. She was married when twenty and has two sons, ten and six years. Her husband developed pulmonary tuberculosis three years after marriage and has spent much of his time in sanatoriums.

Her early sex life was negative. She had adequate sex knowledge before marriage and sex relations were satisfactory until after the birth of the second child.

Personality: Very sensitive, conscientious and extremely religious, fairly energetic and industrious, rather a good mixer with a fair number of friends and of good intelligence.

Onset of Present Illness: Her symptoms started six years ago, following the birth of her second child. She no longer had any sex desire towards her husband and relations were infrequent. She got sex satisfaction from hot douches. She no longer felt happy. She commenced to feel that her husband was sapping her strength and that he was unfaithful to her. Her symptoms developed gradually and became much more marked during the six months preceding admission. She became very religious. At times she was excited and noisy.

Mental Status: The patient was quiet and seclusive. She talked relevantly and coherently. There were numerous delusions present. She accused her husband of infidelity and felt he exerted some mysterious power over her and sapped her strength. She admitted auditory and visual hallucinations about six months prior to admission in which she saw her dead mother and heard voices singing but denied hallucinations at the time of the examination. There was some confusion and the intellectual faculties seemed impaired. Insight was lacking.

Physical Status: She has lost fifty pounds in the last six months. Her pupils were somewhat sluggish to light. The white blood count was 21,000 on admission but dropped to 9,800 in four days.

Progress: The patient improved considerably, both physically and mentally, and was discharged on visit in September, 1924. She soon broke down again and was returned May, 1925. Her mental symptoms had increased, the delusions of persecution were more numerous. There was no change in the physical condition. On July 18. 1925, she was discharged to the Boston State Hospital as unimproved.

Case No. 9. A white male, thirty-three years old, single. Admitted April 8, 1925.

Family History: Negative.

Personal History: Birth and early development were normal. Has never had any serious illnesses, accidents or operations. He finished the ninth grade when sixteen years old, repeating the second grade. He then worked at odd jobs and attended evening high school. Graduated in 1912 when twenty. He continued to work in daytimes and study evenings. He spent two years in the Navy during the war and worked as an electrician and finally as a book agent.

Personality: Always interested in mechanical things, quiet, reserved, somewhat seclusive but got along well with others.

Onset of Present Illness: Exact date cannot be given. Has always

appeared unstable and shown less efficiency siince his discharge from the Navy in 1919. Several months before admission he became more seclusive and preoccupied. Spoke of hearing voices and felt that he was being persecuted.

Mental Status: Patient was rather apathetic and indifferent. Kept to himself. He explained many ideas of reference and persecution and admitted having both auditory and visual hallucinations. Orientation was correct. Memory and grasp of general information were satisfactory. Had no insight.

Physical Status: Pupils a little slow reacting to light and excursion was slightly diminished. Deep reflexes were hyperactive. Tonsils were slightly enlarged and ragged.

Progress: The patient has shown no essential change in his condition while in the hospital. He has been fairly communicative and gone over his symptoms in considerable detail.

Case No. 10: A white female, twenty-six years old, single. Admitted June 6, 1925.

Family History: Negative as far as could be ascertained.

Personal History: Birth and early development were normal. She had measles, scarlet fever and whooping cough during childhood and also had her tonsils and adenoids removed. When about nine years old she had an abscess in the axilla and when about twenty-one had influenza but recovered with no apparent residuals. She finished high school when about sixteen. Was a very good student but could not go to college as she had to help support the family. She worked steadily as a bookkeeper in three different places. Nothing is known of her sex life.

Personality: Always quiet, a poor mixer having very few friends, bashful but not especially sensitive, very conscientious, few amusements, enjoyed reading good literature.

Onset of Present Illness: About three and one-half years before admission the patient had a love affair of two weeks with a cousin. Her family did not approve and he left. The patient then became depressed and lost interest in things. She was unable to work for one and one-half years, was preoccupied with her love affair and had vague ideas of persecution. She once attempted suicide by cutting her arm with a razor. She improved gradually, went back to work for a year and then broke down again about a year before admission. She became depressed again, had hallucinations of hearing and thought people were plotting against her. Her condition became progressively worse up until her admission.

Mental Status: The patient was underactive and restless. She talked but little but was coherent and relevant in what she said. She felt that she was unable to control her thoughts. There were vague somatic complaints which were referred to outside influence and vague

ideas of persecution. She had auditory and visual hallucinations. She was fairly well oriented, her memory was good and she had a fair grasp of general information. She had partial insight into her condition.

Physical Status: There were no noteworthy findings.

Progress: The patient's condition continued unchanged and she was discharged on November 5, 1925, to the Boston State Hospital as unimproved.

Case No. 11. A white male, twenty-one years old, single. Admitted June 1, 1925.

Family History: Negative.

Personal History: The mother had a fall two months before delivery and was confined to bed until the time of delivery which was slightly premature. Birth was instrumental and the patient was a "blue baby." His early development was normal. He had whooping cough at two years, chickenpox at six years, measles at six years and swollen glands of the neck when twenty years old. He finished the third year of high school when seventeen years old. He started work on leaving school and has worked in unskilled positions.

Personality: Always somewhat seclusive, not at all aggressive, very fond of music in which he had considerable talent, reserved and considered different from other boys.

Onset of Present Illness: In 1922 the patient seemed listless, had crying spells and felt that he was being imposed upon at his work. In October, 1922, he remained in bed for several days and became stuporous. He was admitted to the Worcester State Hospital where he remained until May 13, 1924, when he was discharged with a diagnosis of dementia precox—catatonic type, condition improved. He then returned home and tried to work but seemed weak and listless. He was finally arrested wandering about the street at 4 a.m. clad only in a shirt, talking incoherently.

Mental Status: The patient was listless and preoccupied. He was largely indifferent to his surroundings. He was undertalkative, occasionally spoke in a flat, colorless voice. His speech was quite incoherent. He wrote out mathematical problems with a fair degree of accuracy but did not respond to other tests of intellectual functions. It could not be determined whether delusions or hallucinations were present.

Physical Status: Patient was poorly nourished and poorly developed. There was some dullness of the apices of both lungs. Blood pressure was 100 systolic, 65 diastolic. Pupils widely dilated. Hands and feet were cold.

Progress: The patient has continued seclusive and evasive. He does good work in occupational therapy. He shows little interest in his surroundings. At times he has stated that he was Christ. In general he has continued uncommunicative and little could be obtained from him about what was going on in his mind.

Case No. 12. A white male, twenty-seven years old, married. Admitted June 22, 1925.

Family History: One brother is alcoholic. One sister had convulsions during infancy and has been crippled ever since.

Personal History: Little is known of his early life but he is thought to have been an average sort of boy. No severe illnesses or accidents are known. He finished the ninth grade in school and is said to have been bright in his studies. Since leaving school he has worked steadily. For the past nine years he has worked as a painter for one employer and has given satisfaction. He was married when twenty-one and his married life is said to be quite happy. There is one child, a girl of two.

Personality: Inclined to be irritable and fly off the handle but easy to get along with. Made friends easily, was popular among his associates.

Onset of Present Illness: For six weeks prior to admission the patient became more and more preoccupied. He seemed to be brooding over matters which he would not discuss with his wife. He seemed afraid that someone was going to harm him. Three days before admission he would stiffen out in bed in a peculiar way and stare about him but would not say what it was that was bothering him.

Mental Status: The patient was stuporous. There was waxy flexibility. He occasionally spoke a word or two and was apparently in good contact with his surroundings. When pricked with a pin he nodded an affirmative when asked if it hurt but did not make any movement to get away from it. When told to put out his tongue so that a pin might be stuck in it he drew back slightly and said, "Stick pin," and refused to protrude it. His eyes were open and he followed what was going on about him.

Physical Status: No abnormal findings were made out.

Progress: The patient gradually came out of his stupor, remained underactive and would only talk after much coaxing. At times he would wet and soil himself. He was rather impulsive in his behavior. Sometimes he would not eat well and at other times he would demand a great deal of food. Occasionally he would become combative and fight with the attendants or other patients. He swallowed a number of objects such a safety pins, pieces of metal, parts of spoons, etc. He pulled out one tooth and inserted objects into the socket. He inserted the stopper of a hot water bottle up his rectum. Later he became rather overactive and overtalkative, showing a great deal of symbolism. At the time of discharge he was found to have inserted the metal portion of a shoe lace in the meatus of the penis and several pieces of paper into his ears. He was discharged to the Grafton State Hospital on November 5, 1925, as unimproved.

Case No. 13. A white male, thirty-two years old, single. Admitted August 26, 1924.

Family History: The father was very alcoholic. One paternal aunt is insane and is now at the Medfield State Hospital.

Personal History: Birth and early development were normal except for appendicitis with operation at the age of 12. He has had no severe illnesses or accidents. He entered school when six and left at fifteen, having completed the eighth grade. He was considered an average student. After leaving school he worked on a farm and drove a milk wagon for approximately ten years. He then ran a stationary engine, securing a second-class fireman's license and two months before admission to the hospital he secured an engineer's license. He was always a steady worker and fairly thrifty and had no bad habits.

Personality: Quiet, good natured, unaggressive, interested in machinery but few external interests. Never much interested in religion. Fairly sociable.

Onset of Present Illness: His symptoms started about five months prior to admission. He had been trying to secure an engineer's license for five years and when given one at this time refused to use it saying that the inspectors were persecuting him. He felt that Protestants and the Ku Klux Klan were after him. Three weeks prior to admission he quit his work and wandered about the country with insufficient food, finally telegraphing his brother for money.

Mental Status: The patient was quiet and seclusive. He seldom spoke unless spoken to but once started would discuss his ideas quite freely. He felt that he was a self-ordained priest, that he mysteriously influenced a woman in a theatre to fall in love with him, said that the Ku Klux Klan were after him and will eventually get his life. He said that he had frequently heard people talking about him in automobiles as they pass him. They would make such remarks as, "We'll get him," "The Klan will get him." The patient's memory, orientation and grasp of general information appeared quite satisfactory.

Physical Status: The deep reflexes were sluggish and there was a tremor to the fingers. Otherwise the findings were negative.

Progress: The patient improved slightly and was discharged on visit April 21, 1925. He took a job as a fireman for three and one-half months, working steadily but was forced to return to the hospital August 15, 1925, because he felt girls were making advances to him and he asked them to confess to him because he was a priest. The patient is still in the Boston Psychopathic Hospital. His condition has remained unchanged.

Case No. 14. A white female, twenty-four years old, single—Admitted September 5, 1925.

Family History: Two paternal and one maternal cousins have had mental disease.

Personal History: Birth and early development normal. She had double pneumonia when three years old, diptheria when eight and measles at some unknown period during childhood. She finished grammer school when fourteen years of age with a good record. She has worked as a dressmaker until her present illness.

Personality: Always active, a good deal of a leader, fond of dancing, swimming and other sports, sociable.

Onset of Present Illness: About February, 1925, the patient seemed to be irritable and to keep to herself. She stopped her work but wrote to numerous hotels for a position as a waitress in June, 1925. She secured a position as a waitress but soon left it and took a number of different positions which only lasted for a few days. She felt that people were talking about her.

Mental Status: The patient was rather quiet. She often laughed in a silly way without any apparent cause. She denied hallucinations but would sit with her eyes closed and have the appearance of one either hallucinating or living in some fantasy. She felt that people had looked at her in a peculiar way and had a number of misinterpretations. She was correctly oriented, her memory was satisfactory but she did very poorly in tests of general information. For example, she did not know the name of any President of the United States. She had some insight.

Physical Status: Negative.

Progress: The patient has shown much impulsive and peculiar behavior and is apparently deteriorating.

Case No. 15. A white female, fourteen years old, single. Admitted September 11, 1925.

Family History: Negative.

Personal History: Birth and early development normal. Measles, whooping cough and mumps as a child. Has gone to school continuously, skipping one grade and is now a junior in high school.

Personality: Even-tempered, tractable and studious, affectionate, ambitious and capable, fond of outdoor sports but takes too little recreation.

Onset of Present Illness: In the fall of 1924 the patient complained that her school work was hard. She became irritable, did not sleep well and lost her appetite and became less affectionate toward her parents. Said that the children at school made fun of her. Heard imaginary voices. One day she went into the bathroom, locked the door and turned on the gas. Told her father he looked like a Chinaman. Laughed without cause.

Mental Status: The patient tended to keep by herself. She laughed a great deal without apparent cause. One time she admitted that she heard voices saying funny things. She usually talked in a very vague and irrelevant manner. She thought people talked about her. Said she had been unable to sleep well or study during the past year because of

the voices that she heard. She was well oriented, her memory appeared intact and she had a fair grasp of general information. She had considerable insight.

Physical Status: Negative.

Progress: Patient's condition has continued unchanged.

Case No. 16. A white female, twenty-six years old, married. Admitted September 19, 1925.

Family History: Father and mother are somewhat irritable and unstable.

Personal History: Birth and early development normal. As a child she had whooping cough and scarlet fever followed by Bright's disease. Later she had a tonsillectomy. She finished the ninth grade when fifteen years of age. Was considered an average pupil. Worked at odd jobs until she married. There are two children, aged four and two.

Personality: Fond of dancing for entertainment. Read fiction and the newspapers. Liked music. Always of a somewhat unstable disposition. Found it hard to settle down after marriage.

Onset of Present Illness: The patient has never been well since the birth of her two children, both of whom were instrumental deliveries. She complained that her housework was too much for her and that she could not stand the strain of housework and the children. Her mother constantly sided with her and told her that her husband did not appreciate her. Her physical complaints increased gradually until the time of admission.

Mental Status: Patient was quite underactive. She complained a great deal of various physical ailments. There was some looseness of thought. She spoke of seeing and tasting blood. There are probably auditory hallucinations. The intellectual functions were somewhat impaired.

Physical Status: Twenty pounds under weight, some unsteadiness of gait, possibly due to weakness. Otherwise negative.

Progress: The patient has been kept in bed and fed liberally. She has increased about twenty pounds in weight but her physical complaints have increased rather than decreased and she appears to be weak and restless. There has been no improvement aside from the gain in weight.

Case No. 17. A white female, thirty-eight years old, single. Admitted September 30, 1925.

Family History: Negative.

Personal History: Birth and early development normal. She finished the sixth grade of school when about thirteen years of age showing average ability. She then went to work. She has worked in millinery stores ever since. She had influenza in 1918. Her thyroid has been enlarged fifteen or sixteen years.

Personality: Somewhat seclusive but pleasant and entertaining in the presence of others. Not oversensitive. Fairly capable.

Onset of Present Illness: About two years ago it was noticed that the patient had lost approximately forty-five pounds in weight and that she looked "run down." Gradually she became more seclusive. She would sit in one position for hours at a time without making a movement or saying a word. She thought that people were putting chloroform into her room. Said she had worms and bugs inside her. She felt that people were after her and were trying to put her in prison.

Mental Status: Patient was quiet and showed no peculiar behavior. She stated that she felt a little lonesome and worried because people were talking about her. She expressed numerous delusions of persecution. It was impossible to say whether there were hallucinations of hearing or not. Orientation was correct and memory seemed good. Her grasp of general information was rather poor. She had no insight.

Physical Status: Forty-eight pounds underweight. Thyroid enlarged and soft. Eyes slightly prominent.

Progress: Patient's condition has continued unchanged.

Case No. 18. A white male, thirty-eight years old, single. Admitted September 21, 1925.

Family History: Nothing known.

Personal History: Nothing known about his early life. For the past five years he has worked as a pin boy in a bowling alley.

Personality: Nothing known.

Onset of Present Illness: The exact date of the onset is not clear. It is known that for the past two or three years he has acted very peculiarly. He would order persons out of the bowling alley if he did not like their appearance. He would often disappear for a few days. He was considered odd by his associates.

Mental Status: The patient was quiet, pleasant and coöperative. There was considerable language difficulty but even then he appeared undertalkative and not to grasp the meaning of many simple questions. He seemed indifferent to his surroundings. He said that he was going to die and that people were going to kill him. He admitted that he heard voices telling him these things. He also admitted visual hallucinations. His orientation was impaired for time and place and possibly for person. There was considerable impairment of the intellectual functions. It was difficult to say how much was deterioration and how much was due to a constitutional intellectual defect.

Physical Status: The physical examination showed that the patient was slightly undernourished. His pupils reacted sluggishly to light. The knee jerks were greatly diminished. There was moderate tremor of the outstretched hands.

Progress: The patient has shown no change in his condition while in the hospital.

Case No. 19. A white female, twenty-one years old, single. Admitted September 29, 1925.

Family History: Negative.

Personal History: Birth and early development normal. Measles, whooping cough and mumps as a child. Cholera infantum at nine months. Pneumonia at four years of age. Started school at five and finished two years of high school when fifteen after which she studied stenography for two years in business college. Was always bright and capable in her studies. Since the age of seventeen she has been working as a stenographer. It is said that she is not a good worker, that she is careless and not prompt. She has had a number of different positions, often leaving positions for no particular reason.

Personality: Quiet, shy, not much of a mixer, had few friends, very conscientious, never interested in her work, inclined to day dream.

Onset of Present Illness: For the past year the patient has stated that the girls at work were laughing at her. One day she stuffed absorbent cotton into her ears because she said she did not wish to hear so much noise. She lost interest and ambition and remained at home for six months preceding admission during which time she has been hearing voices.

Mental Status: The patient was overactive, apathetic and indifferent. Her speech was coherent. She stated that people were laughing at her and that people around her would have "dark and jealous faces." There were auditory and visual hallucinations. She was correctly oriented. Her memory was good and she had a good grasp of general information. She had poor insight.

Physical Status: Weakness of the external rectus of the right eye, present since early childhood. Otherwise negative.

Progress: The patient's condition has continued unchanged.

Case No. 20. A white male, nineteen years old, single. Admitted October 6, 1925.

Family History: Mother, father and one brother are unstable and are given to fits of temper.

Personal History: Birth and early development normal. He had measles, mumps, whooping cough, scarlet fever and chickenpox as a child. He finished the ninth grade, after skipping one full grade, at the age of fourteen. About this time he seemed to have difficulty in grasping things in school and it was advised that he leave school and take a rest. On leaving school he went to work and has been a printer's apprentice most of the time.

Personality: Always shy and retiring, inclined to be seclusive, fond of reading, subject to violent fits of temper, never frank and open.

Onset of Present Illness: About January, 1925, the patient complained of inability to concentrate and feeling "heavy." A little later he desired a change of work. The patient then had a number of visions and felt that a young lady he saw was someone else. He demanded her name and when she laughed at him he fell over in a dazed state. Shortly after this he heard a voice telling him he was the Messiah.

Mental Status: Patient was quiet and well behaved. He saw peculiar meanings in trivial happenings, he believed that people were talking about him and had delusions of persecution. He believed that he was the Messiah, had auditory and visual hallucinations. He was correctly oriented and memory was unimpaired and he had a good grasp of general information and there was practically no insight.

Progress: The patient's condition has continued essentially unchanged.

Case No. 21. A white female, twenty-seven years old, single. Admitted June 25, 1925.

Family History: The mother is alcoholic and she and the father do not get along well together. One brother was a patient at the Boston Psychopathic Hospital in 1923.

Personal History: The mother was not very well during the pregnancy and the patient nearly died at birth. She had measles, mumps and whooping cough as a child. She was said to have always been nervous but definite data is lacking. She did not play well with other children but kept to herself and was interested in her books and her school. She graduated from the business course in high school at eighteen years of age. She then went to work as a stenographer and has worked steadily ever since. When ten years of age she was taught masturbation by an older girl.

Personality: Always sensitive, very tractable and obedient, very fussy and particular, extremely religious, fond of reading "perfectly clean novels" and religious books.

Onset of Present Illness: In November, 1924, the patient developed a fear of men. She felt that a man came into her room at night and had sex relations with her and that she was pregnant. Her condition grew progressively worse until her admission.

Mental Status: The patient was quiet and very coöperative. She cried frequently, appeared worried and said that she had a great many fears. She talked in a coherent and logical way concerning all matters. She stated that she feels in the morning that a man has been with her during the night and that she has been violated by this man. She had numerous fears. She was afraid of men, of everything that she ate, of toilets, of taking a bath. "She once went a month without taking a bath." There were no hallucinations. Her orientation, memory and general information were excellent and she had a good deal of insight.

Physical Status: Essentially negative. There was slight tenderness

in the right lower quadrant of the abdomen and a fine tremor of the fingers.

Progress: The patient gradually improved while in the hospital. She became less bothered by the ideas that were upsetting her and after a great many interviews with the physicians she professed to understand how her condition had come about. She still continued to be somewhat unstable emotionally. She was discharged September 30, 1925, as improved and took up work outside as a stenographer.

Case No. 22. A white female, sixteen years old, single. Admitted March 25, 1925.

Family History: One maternal uncle was psychotic and committed suicide.

Personal History: Birth and early development normal. Was quite sick at one time when teething. She finished the eighth grade in school when fourteen years old.

Personality: Quiet, usually happy, enjoyed the company of other girls.

Onset of Present Illness: Her sickness probably started about two years ago, during her last year of school. She would complain of pains in her head, her hands and her body. She would scream out at times. She was unable to sleep well. Would strike persons in a fit of temper. Would keep to herself. Spoke of getting messages from God and of imagining "bad" about herself and other people.

Mental Status: Fairly cheerful and quiet. Occasionally a little depressed. At first she stated that she received messages from God, that she heard His voice "as if coming from far." At night she would see devils. She felt that people looked at her on the street and were talking about her. Later she spoke as if the hallucinatory experiences were not as she had first represented them to be and called the voices vivid thoughts. There were numerous obsessions and compulsions. She was correctly oriented and her memory and general information were good. She had considerable insight.

Physical Status: Question of slight ptosis of right upper eyelid. Fine tremor of fingers.

Progress: The obsessive and compulsive behavior has become more marked and the patient denies any actual hallucinatory experiences. It is difficult to determine what is the correct view concerning this.

Case No. 23. A white female, fourteen years old, single. Admitted January 21, 1925.

Family History: The mother had a psychotic episode at the time of the pregnancy before the patient was born. Later she committed suicide in another spell of depression.

Personal History: The patient was always sensitive and high strung as a child. She had terrifying dreams which have continued up to the

present time. There is still some enuresis present. She has always bitten her fingernails. She finished the eighth grade at fourteen years of age.

Personality: The patient has always been quick-tempered, stubborn. She has never gotten along well with her step-mother and her family and has been very irritable. She has not been sociable. Has read a great deal. Has not had many friends.

Onset of Present Illness: During the past year the patient has had a number of fainting spells, following which she seemed somewhat confused. She said that she worried about her mother and that she was afraid of insanity.

Mental Status: The patient was inclined to be somewhat seclusive. She had a number of mannerisms. She appeared somewhat depressed and unhappy. She would often sit for long periods at a time gazing into space and would not answer any questions the physician asked her. She stated that on two occasions she had actually heard her mother's voice calling to her. She was correctly oriented. Her memory and grasp of general information were good. She had some insight.

Physical Status: Over a period of a number of months her urine showed sugar present a considerable part of the time. At one time there was as much as ½ of 1 per cent. Occasionally there were hyalin and fine granular casts with some albumin. The blood sugar was always normal. Careful physical and neurological study, including electrocardiogram, was negative.

Progress: The patient improved slightly while in the hospital and was discharged August 13, 1925, as improved. She has apparently made a fair adjustment at home.

Case No. 24. A white female, twenty-seven years old, single. Admitted October 17, 1922.

Family History: Maternal grandfather alcoholic and later became insane. Mother had Huntington's chorea. One maternal uncle was alcoholic.

Personal History: Birth and early development were normal except that enuresis persisted until fourteen years of age. Strong and healthy as a child. Tonsils and adenoids were removed sixteen months before admission. For the past ten years she has had fainting attacks, particularly during her menstrual periods. She finished grammar school at fourteen and has worked ever since in clerical positions with only a moderate degree of efficiency.

Personality: Always shy and sensitive she made friends with difficulty.

Onset of Present Illness: The patient has shown a decrease in industrial efficiency during the past few years, being constantly discharged from positions. She refused to see her mother and aunt. She was much disturbed over a love affair.

Mental Status: The patient was quiet and coöperative. She seemed to show lack of emotion and to be entirely unconcerned about matters. She would frequently smile when discussing matters which should have been serious to her. She admitted a great deal of day dreaming and fantasy with regard to the young man who had jilted her and claimed that she felt he would some time come back to her.

Physical Status: There were no noteworthy findings.

Progress: The patient was discharged from the hospital on December 8, 1922. She went to live with her aunt and worked at odd jobs at different times. She seemed quite uninterested and indifferent and made little effort to secure work and was content to allow her aunt to support her. She was readmitted to the hospital on June 17, 1925. She showed essentially the same sort of behavior as on her previous admission. She talked more freely about her love affair and explained that she felt a certain man intended to marry her because she once heard him whistling "Until We Meet Again." Although this man is now married and the patient has been informed of it she still insists that the man is in love with her and that he will some day come to her. Her condition has continued essentially unchanged although she has done some work about the hospital and shown a little interest in things.

BIBLIOGRAPHY

1. Kraepelin, E. Dementia Praecox. E. & S. Livingstone, Edinburgh, 1919.
2. DuBois, D., and DuBois, E. F. Clinical Calorimetry. Arch. Int. Med., 17:863, June, 1916.
3. Janney, N. W., and Isaacson, V. T. The Blood Sugar in Thyroid and Other Endocrine Diseases. Arch. Int. Med., 22:160, August, 1918.
4. Rowe, A. W. The Metabolism of Galactose. Arch. Int. Med., 34:388, September, 1924.
5. Benedict, S. R. The Determination of Uric Acid in Blood. J. B. C., 51:187, 1922.
6. Kramer, B., and Tisdall, F. F. The Direct Quantitative Determination of Sodium, Potassium, Calcium and Magnesium in Small Amounts of Blood. J. B. C., 47:223, 1921.
7. Bell, R. D., and Doisy, E. A. Rapid Colorimetric Methods for the Determination of Phosphorus in Urine and Blood. J. B. C., 44:55, 1920.
8. Austin, J. H., and Van Slyke, D. D. Determination of Chlorides in Whole Blood. J. B. C., 41:345, 1920.
9. Kottman, K. Kollidochemische Untersuchungen über Schilddrüsenprobleme. Schweiz. med. Wochenschrift, 1–644, 1920.
10. Denis, W., and Ayer, J. B. A Method for the Quantitative Determination of Protein in Cerebrospinal Fluid. Arch. Int. Med., 26–436, October, 1920.
11. Kasanin, J., and Knapp, E. A Study of External Factors Causing Variable Results in the Kottman Reaction. Submitted to Arch. Int. Med.

Society Proceedings

NEW YORK NEUROLOGICAL SOCIETY

The Four Hundred and Thirty-Second Regular Meeting, January 4, 1927. The President, Dr. I. Abrahamson, Presiding

BRACHIAL PLEXUS PARALYSES

[Author's Abstract]

Dr. Vincent Giliberti

Brachial plexus paralyses form the second largest group of birth palsies. They occur most frequently in cases requiring artificial aid for birth of child and are more frequent in head than in breech, shoulder or foot presentations. Traction upon the brachial plexus, and abduction, elevation and backward movement of the right arm at the same time that the head is bent towards the opposite side, are responsible. Compression or stretching of the brachial plexus in attempted to free an arm or deliver a shoulder or after-coming head will also produce similar injuries. Introduction of a finger or hook into the axilla when the shoulder is delayed may lead to compression either by direct pressure on the plexus or indirectly by pressure of the clavicle when shoulder and clavicle are pushed backward and upward. Forceps blades rarely may reach the cervical region and damage the plexus. More often this form of paralysis is due to pressure or traction exerted on the shoulders in attempting to accelerate the birth of the head by such methods as the Prague, Smellie-Veit, or Mauriceau, or the combined methods. Complications of obstetrical paralysis may be fracture of humerus or clavicle, dislocation of a shoulder, hematoma of sternocleido-mastoid, and separation of epiphyses. These complications are no longer looked upon as the actual cause of the paralysis.

The nerve fibers and bundles of the plexus are usually torn asunder or ripped apart and not just simply crushed or cut in one place as in most traumatic nerve lesions. Overstretching breaks the funiculi at any point from the spinal cord origin of the roots, to the most distal point of trauma, causing irregular injury. Examination of cross section of resulting scar discloses incomplete interruption of continuity.

It is difficult for a neurosurgeon to determine exactly at what level excision of the scar will give him intact funiculi, for there may be interruption in a number of places. Lesions of compression, trac-

tion, or laceration vary only in degree. After slight compression restoration of function is usually rapid and complete. If greater compression over a comparatively long period of time there may be radical organic changes, resulting in disintegration of the medulla and axis cylinders extending the entire length of the nerves distal to the site of injury. If traction has been the cause of paralysis the disturbance may be transient or permanent, depending upon the degree of trauma. In cases of avulsion of the root from the cord, the cord has been found smaller and flattened in its anterior portions at the level of the injury and the anterior horn area is involved in a sclerotic process. Gray matter is deformed on both sides, the cells completely absent on the affected side and on the opposite side only a few darkly stained elongated forms remaining. Most common types of brachial plexus paralysis are the upper arm type (Duchenne-Erb), due to injury of the 5 and 6 C. roots or the upper primary cord of the plexus which originates from these roots. This is the most common type and everything else being equal, offers the most favorable prognosis. The lower arm type of brachial plexus paralysis (Klumke-Dejerine type) is caused by a lesion chiefly involving the 7 and 8 C. and 1 T. roots. This form is often the residual of combined type, sensory symptoms are usually present, but as in the cases of Erb's palsy, are difficult to elicit in infants.

The combined type of brachial plexus paralysis partakes of the nature of both types previously described, and is due to a lesion involving the entire plexus or most of it. The prognosis of brachial plexus obstetrical paralysis is much less favorable than that of ordinary peripheral nerve lesions. Mild compression traction paralysis may be recovered from in a few days or weeks. If severe, it may take as long as two or three years. If actual laceration with severance of continuity, separation and displacement has taken place, we can only expect recovery by resorting to neurosurgery. From the standpoint of clinical types, upper arm type offers the most favorable prognosis, lower arm type next, and finally the combined type.

One of the grave dangers of a long-existent obstetrical paralysis is that a habit palsy may replace the organic one when nerve conduction is finally restored. The various complications need to be treated surgically as described in various books on surgery. Paralysis proper is taken care of by immediately immobilizing the affected extremity to prevent additional hemorrhage and further separation of nerve segments. A splint of aluminum lined with soft felt, extending from hip to axilla, holding arm elevated in abduction at an angle slightly more than 90 degrees, will help to approximate the torn nerve ends. The hand and forearm should be kept in full supination to overcome the tendency to pronation. The general nutrition of the involved parts can be favorably influenced by electrical stimulation, massage, heat, hydrotherapy, and exercises. All the forms of treatment should be so conducted as not to interfere with the postural treatment. If signs of regeneration have appeared within one year the mechanical and physical treatments should be continued. If there are positive evidences of interrupted regeneration or no regeneration at all after

a year, one is justified in resorting to neurosurgery. Contractures are best overcome by the method of gradual correction.

Discussion: Dr. T. P. Prout said: About twenty years ago, Taylor, L. P. Clark, and myself presented some work on this subject. The paper described about six cases which concerned themselves mainly with the type of palsy that is induced by the rupture of the outer cord of the brachial plexus and eventuating in the upper arm type of palsy. In several of these the lesion was in such a position that its excision accomplished a fair result: in some others the lesion was more complicated and the result was less favorable but some improvement was shown. In all, the condition had existed for a long time so that any improvement was a gain. There were no very early lesions in that series. Subsequently I saw several very early cases in the course of my service at the Vanderbilt Clinic; some did well on a simple regime of massage. The lesion is easy to palpate in the newborn infant and the younger children. I would call attention to the fact that even the neglected cases are not absolutely hopeless. Excision of the lesion and resection of the nerve ends accomplishes something. Of course, where there is evulsion of the nerve at the cord, one cannot expect to accomplish much. However, these cases presenting a lesion of the outer cord of the brachial plexus eventuating in the upper arm type of palsy do respond to treatment, and where neglected and conservative means fail, surgical intervention should be considered.

Dr. John Hugh Nolan said: The sooner the cases are treated, the easier it is to get results. As Dr. Giliberti said, it is a matter of degree of injury that counts. Having been connected with a maternity hospital for a number of years, I found that sometimes it is necessary to exert great traction, so much so in fact that at times you can actually hear the nerve trunk snap. I have followed many of these palsies in newborn babies, and any improvement usually occurs within the first six months. I have seen a few get well, but these had minor injuries. In the severe types the chances of a good recovery are very poor. These cases as regards early operation are in the same category as the newborn with cerebral hemorrhage.

Dr. Michael Osnato said: Dr. Giliberti did not have the opportunity to say something about the clinical side of his case, which illustrated several points he made in his paper. I have seen the girl several times. The story was that she did not improve perceptibly for a long period, and then rather suddenly; in the short space of a very few months, following an infection, she made what appeared to the family to be an almost miraculous recovery. When seen at the New York Post-Graduate Clinic, it was found that she did not have an R.D., and in spite of some wasting in the shoulder girdle group her reflexes were quite negative. There were no, or very few, residual sensory disturbances, and apparently what had happened in

her case was the thing Dr. Giliberti has called attention to in his paper, namely, that she had developed a habit paralysis, and when the habit disappeared, recovery, which had unquestionably taken place a number of years before, was then allowed to make itself manifest in a very short time. I think it might be well to stress again the point that surgery is not the method of choice, so far as routine treatment is concerned, in these cases. The postural treatment, with patient and persevering physiotherapy over a long period of time, is the regimen which offers the best results.

Dr. Charles Rosenheck said: A considerable number of these cases drift to the institution I am associated with, an orthopedic institution, and we see quite a number of these children with both upper and lower arm palsy. They come in soon after the birth of the baby, or some time after. Of course Dr. Giliberti will bear me out in this, that it is a very difficult matter to take electrical reactions in children. They cry a great deal, and nothing will be gained by that sort of thing, but we do try to determine the amount of palsy by the position of the baby's arm and the amount of functional disuse. Our orthopedists put the child up in what they call the "aeroplane" position, *i.e.*, abduction of arm to a horizontal and externally rotated position. It is rather awkward. The babies obviously do not object to it, but the mothers do, because it entails a considerable amount of work on the part of the mother in dressing and undressing the child, but after it is explained to them, we get good coöperation. The results are good in those in which there is no nerve avulsion or tearing; *i.e.*, in the ordinary stretching of the nerve roots we get a considerable functional recovery. We use that treatment for a period of four to six months. The baby is then brought in for massage, and electrical treatment. This treatment is kept up for six months to two years, and if there is no recovery the orthopedist takes the stand that nothing further can be done for the case. Operative procedures are then instituted (devised by Dever of Boston) which are intended to divide those muscles which keep the arm fixed in an adducted and inward rotated position. After this operation is performed, the child is again put up in the so-called "aeroplane" position, but just the reverse of what the original position was, that is, external rotation, and the child is kept in that position for possibly a period of two or three months, and the electricity, exercises and massage are kept up. It is purely an operation not intended to correct the entire functional use of the arm, but it prevents that awkward inward rotation and offers a fair amount of functional recovery.

Dr. I. Abrahamson said: I wish to stress two things in examining these children: In the first place, we must keep a record of the movements that are preserved. From time to time all the movements should be noted in the record of the case, and they should not be left to the memory of the examiner. In order to discover the movements possible, watching the child will be found to be a long and tedious task; we must test them by noting their resistance to passive move-

ments. The child will resent passive movements and we can test one group after another.

Dr. Giliberti (closing the discussion) said: I might dilate on what Dr. Osnato said about the patient who was to have been presented this evening. She was fourteen years of age when she came to the hospital, and she had absolutely no use of the right upper extremity. There was atrophy of disuse which was generalized over the entire extremity. She was not able to write with the right hand. She had become accustomed to writing with the left, and at the same time she had a peculiar sensory disturbance over the radial side of the lower half of the right forearm on the anterior surface which one might think had something to do with the brachial paralysis. She had a definite history of a brachial paralysis, but there was a patch of atrophied skin which prompted us to send her to the skin men for diagnosis. They made a diagnosis of morphoea, a form of circumscribed scleroderma, and they considered the anesthesia and other sensory disturbances as being caused by the morphoea. Under arsenic treatment the skin lesion improved, and as it improved the sensory disturbances also improved. In about two and a half months she could use that extremity perfectly well and normally. Within six months her handwriting was legible, and when I last saw her, about a year after treatment was begun, she wrote better with the right hand than with the left. I believe this was really a case of habit paralysis.

ADHESIVE SPINAL ARACHNOIDITIS SIMULATING SPINAL CORD TUMOR. OPERATION AND COMPLETE RECOVERY

Byron Stookey, M.D.

[Author's Abstract]

This patient, a painter, appeared at the Post-Graduate Hospital on the service of Dr. Osnato in March, 1925, with complete paralysis below the arms; unable to move the legs, having a spastic paraplegia with incontinence. He had been treated for some time previously for lead intoxication, principally because he was a painter. Dr. Osnato's diagnosis was spinal cord tumor, with which I concurred, and laminectomy for spinal cord tumor was done. Complete obstruction of the subarachnoid space was shown by manometric study.

A definite sensory level was established. The neurologic signs and progressive evolution of the symptoms led us to believe that a spinal cord tumor would be found. There was nothing atypical for spinal cord tumor in his history, or in the progression of his symptoms. At operation no tumor was found, but a very definite circumscribed adhesive arachnoiditis was exposed. The adhesions were freed without bleeding and the dura closed. An uneventful recovery

occurred with gradual return of function, both of the extremities and bladder, so that he was able to return to his home. Since discharge he has been following his occupation, that of a painter. The patient is now subjectively well, except he has some urinary urgency.

This case is presented to show that circumscribed adhesive arachnoiditis can be cured by operation, providing it is limited. Unfortunately, most of the cases of so-called arachnoiditis are not circumscribed. It is usually a diffuse process, and consequently one not amenable to operative approach. If the adhesions can be broken a fairly good operative result follows. The interesting point in this man's history is the gradual progression of symptoms almost atypically that met with in spinal cord tumors. In most of the cases which I reviewed some time ago in a paper read before the American Neurological Association the preoperative diagnosis was spinal cord tumor. In only the last two cases of the series were we able to make a preoperative diagnosis of adhesive arachnoiditis. There are two main differential points which, if present, aid in establishing the diagnosis. The history shows a long and gradual evolution. However, this man's history was short. The other point which permits of a diagnosis beforehand is that in the presence of a total block of the subarachnoid space usually no increase in the total protein content is found. This is an extremely valuable point because when a tumor obstructs the subarachnoid space venous circulation of the spinal cord is interfered with and diapedesis results. In adhesive arachnoiditis an ideal set of conditions causing obstruction of the subarachnoid space, *without interference with the venous circulation,* is established, permitting one to prove the rôle engorged veins with diapedesis plays in producing an increase in the protein content. In adhesive arachnoiditis no increase in the total protein content takes place.

Where the diagnosis can be made before operation, these two points are of value, viz.: first, a long progressive history; second, subarachnoid obstruction without increase of protein content in the cerebrospinal fluid.

Occasionally in the history a note of some previous general infectious disease is related. The etiological factor is obscure. We know that many infectious processes are associated for a time during their course with a mild degree of meningitis. It is possible that such previous infectious processes may be the etiological factor.

The progressive story is extremely interesting. The explanation offered is but a theory, namely, that adhesions of the pia arachnoid and dura fix the cord to the dura, gradually interfering with the free back and forth movements of the spinal cord. The spinal cord undergoes constant back and forth rhythmic movements during each respiration. After years of continuing slight traumatism produced when these movements are interfered with by fixation of the cord at any given segment gradual interruption of condition of the long fiber tracts of the segment occurs. Interruption of conduction once established, it continues: once the symptoms appear a gradual evolution takes place. In this respect adhesive arachnoiditis simulates spinal cord tumors.

A simple laminectomy was done and the circumscribed adhesions broken. I am demonstrating this man not to show a brilliant result, but to show that circumscribed adhesive arachnoiditis is amenable to surgical treatment and that essentially a cure can be obtained.

Discussion: Dr. Abrahamson said: Does one see, in these cases, an acute exacerbation of symptoms following lumbar puncture, such as one occasionally sees in tumors of the cord?

Dr. S. P. Goodhart said: We are all familiar with Dr. Stookey's contributions on this subject. The clinical forms which he has described are becoming more familiar to us as we recognize the symptoms and associate them with this particular form of lesion of the spinal meninges. This particular case differs from most of the cases heretofore described, as I recall them, in that it presents a more acute symptomatology; the case doubtless belongs in the category of those cases he has previously described, but differs from them in that this case presents a much longer duration. This presentation brings to my mind a case of arachnoiditis seen at the Bronx Hospital and which ran a very acute course. Having seen several cases of this group, I was able definitely to make the diagnosis—I say definitely, yet of course with that degree of reservation which is demanded in such intricate cases. Dr. Joyner, at my suggestion, operated upon the case and at once recognized the involvement of the pia arachnoid; there was a very manifest inflammatory arachnoiditis with adhesions and pressure upon the cord. A diagnostician from the Board of Health had seen the case previously and made the diagnosis of encephalitis. With this I could in no sense agree. The patient had what was regarded as a mild "flu" lasting a few days; she complained of severe pains in her chest which, upon careful investigation, I regarded as root pains. The patient was brought into the hospital, however, as a case of pneumonia. When I first saw her there was a definite hyperalgesia at a level of the third and fourth thoracic dermatones; definite Kernig, rigidity of the neck, and nystagmus. The spinal fluid was at first under great pressure and the fluid contained only a few cells, with slight increase in globulin. In the course of the following few days, that is, about ten days after the acute onset, there occurred mild tonic fits with periods of unconsciousness, sudden general rigidity, and dilatation of the pupils. Subsequent spinal punctures showed a gradual diminution of pressure and within a few days a definite xanthochromia, some three hundred polymorphonuclears with marked increase in globulin. The area of hyperalgesia remained definite. There were no sensory changes and no definite pyramidal tract signs. Sugar disappeared from the fluid. The picture strongly suggested to me that type of localized lesion, in this case of rather acute onset, that Dr. Stookey has described; it is of interest to note that the fluid gradually was so reduced in pressure as to essentially disappear. There were no organisms in the field. I felt that we had definite evidence of a localized lesion, inflammatory rather than neoplastic. The operation confirmed the suspected con-

dition. I feel that some of the cases which simulate cranial neoplasms, especially of the base, and in which operation fails to reveal a growth, are really of the character described by Dr. Stookey.

Dr. E. D. Friedman asked: Was there evidence of arachnoid cyst formation in this case?

Dr. Henry A. Riley said: I have been very much interested in this condition. At the Neurological Institute we have seen three or four instances, and the matter has come up at our conferences. There are two conflicting points of view which particularly struck us during their consideration. Most of the cases presented rather a long course leading up to the picture which simulated a spinal cord neoplasm. There usually is a definite interference with the long conducting tracts, both those coming toward and going from the brain, with pyramidal tract signs, and with more or less indefinite sensory level symptoms with sphincteric disturbances and a certain amount of pain. When a lumbar puncture was done, they presented the classical appearance of a spinal cord tumor. On the one hand, there was the incomplete picture of a spinal cord tumor on the clinical side, and from the special investigative viewpoint there was the classical picture of a tumor, and it is the balancing of the two features which is important in determining whether the case is one of arachnoiditis adhesiva spinalis or a spinal cord tumor. I think this is a very instructive case demonstration for us to see. It shows that all patients who have even indistinct evidence of a level lesion with interference with the cerebrospinal fluid circulation should be operated on, and if this condition is found they can often look forward to an amelioration of their disease, if not to complete recovery.

Dr. Wilder Penfield said: It is of utmost importance to bear in mind the point that Dr. Stookey has made with regard to these cases—that you may have a complete block with no xanthochromia and no increase in protein content. This case is atypical in several respects: the presence of xanthochromia; the rapid development of symptoms, and a well localized and well circumscribed arachnoiditis. This might bear out the point of view that the increase in protein below the block is due, not to exudation from the vessels of a tumor, but to localized constriction of the vessels in the spinal cord. That is also borne out by the fact that xanthochromia develops even when the tumor is a chondroma where there is almost no blood supply, and when the tumor is outside the dura, and in cases where the compression is from a cold abscess. It seems to me that this type of well circumscribed arachnoiditis which Dr. Stookey has pointed out here, with rapidly developing symptoms, may well compress the veins in the cord itself and thus give rise to increase in the protein; whereas he has pointed out in the other cases, where the adhesions are more diffuse, there is no increase.

Dr. Rosenheck said: Can Dr. Stookey explain the absence of spinal arachnoiditis in cases of meningitis that occur in childhood,

that are followed for a great many years, and are not followed by spinal block? Possibly the explanation he gave for the ordinary infectious processes that produced circumscribed serous meningitis may not apply to the meningitis of the meningococcus variety.

Dr. Stookey (closing the discussion) said: In answer to the chairman's question as to whether the symptoms were increased after lumbar punctures, I do not recall that I ever saw a case in which they were. I have seen one or two cases in which they were improved after lumbar puncture. I would not be willing to say offhand whether any were made worse after it, because I do not recall definitely.

As to Dr. Goodhart's comment, I would recall to him those cases described by Dr. Horax of adhesive arachnoiditis of the posterior fossa which simulated cerebellar tumors so that apparently a clinical picture of cerebellar tumors may occur by adhesive arachnoiditis within the cranial cavity.

Dr. Riley has emphasized a point that I am very much in sympathy with, mainly, that if a level lesion is found with subarachnoid obstruction I think exploration should be done. A level lesion with subarachnoid obstruction should always be explored.

As to Dr. Penfield's comment concerning the source of the xanthochromia and increased protein, I meant to imply that the source of both was from the congested veins of the spinal cord, and that it occurs whether the tumor be extradural, a chondroma, or a cold abscess; or from any condition which obstructs the circulation of the veins of the spinal cord. It is generally accepted that obstruction of these veins gives rise to increased protein and xanthochromia.

Concerning Dr. Rosenheck's question, why in so-called meningitis of childhood of the meningococcus type we do not have adhesive arachnoiditis afterwards, I have no explanation. We do know that various organisms give rise to various types of tissue reaction, witness the type of membrane formed by the diphtheria bacillus, and certain types of streptococcus. We know that tissue reactions differ in various processes. I think he should ask that question of Dr. Globus and not of me. I would be glad if Dr. Globus would tell me, for I have no explanation to offer.

I do not want anyone to think that this good result is what is usually obtained. We have operated on some cases with no improvement. To the extensive processes we can do little or nothing. Unless the adhesions can be freed no good is likely to come of the operation whether or not it is an extensive process or a limited one. Exploration should be done when the diagnosis is established.

SPINAL CORD COMPRESSION IN HODGKIN'S DISEASE

Report of a Case in Hodgkin's Disease of Thirteen Years' Duration

George A. Blakeslee, M.D.

[Author's Abstract]

Compression of the spinal cord from disease of the peridural tissles such as has been known to occur in the lymphoplasias of the peridural lymphoid tissue in Hodgkin's disease is rare. In a review of the literature a few cases are described in which paraplegia is associated with Hodgkin's disease, some with clinical symptoms without a post-mortem examination, and others with clinical symptoms and corroborative post-mortem findings. The following case of Hodgkin's disease of about thirteen years' duration, with a complicating paraplegia developing after ten years, was reported, and the case presented.

When the patient was fourteen years of age, lymph node enlargement was first noticed in the right supraclavicular region, and on biopsy was diagnosed as Hodgkin's disease. Following X-ray therapy the cervical lymph nodes disappeared. A remission of eight years followed, during which time the patient enjoyed excellent health. Then there started a constant, dull, aching pain in the abdomen, and physical signs revealed a large mass in the epigastric region and a few lymph nodes in the neck. A second biopsy diagnosed the case as Hodgkin's disease. Following X-ray therapy the mass in the abdomen disappeared and the symptoms were relieved.

About eight months later sharp shooting pains radiated from the shoulder blades to the anterior thoracic region. Six weeks later there was complete paraplegia with sensory change from the fifth thoracic level downward, and bilateral pyramidal tract signs in the lower extremities. Following X-ray treatments the patient was able to take a few steps in about three months, and in nine months got about with the assistance of a cane.

Two years later he entered the Post-Graduate Hospital with a fever, increased difficulty in walking, weakness, loss of weight, and large glandular masses in the left and right axillary and pectoral regions. Histological examination of a gland from the right axillary region diagnosed Hodgkin's disease. The neurological examination revealed some spasticity in gait, bilateral pyramidal tract signs, and posterior column sense impairment in the lower extremities.

The axillary, pectoral, and cervical regions of the body were given X-ray treatments and the glands disappeared. The patient was advised to live in the country, and gained twenty pounds in weight, strength increased, and his locomotion improved.

It is felt that the difficulty in locomotion at the time of his entrance to the Post-Graduate Hospital might have been due to the general weakness as a result of the general adenopathy, but the presence of localizing spinal cord signs speaks for local involvement of the spinal cord.

The patient showed very definite signs of spinal cord compression which receded under X-ray therapy along with the general signs of Hodgkin's disease. Reports of necropsies in the literature prove that the lymphogranuloma of Hodgkin's disease can occur in the peridural space as a localized process. It seems fair to assume that this case of localized spinal cord compression in Hodgkin's disease can be explained in this way.

Discussion: Dr. Ward H. Cook (by invitation) said (demonstrating lantern slides): Cases of Hodgkin's disease typically exhibit a somewhat symmetrical enlargement of the cervical nodes on both sides of the neck, with dyspnoea and moderate emaciation. The illustration will recall to your mind the essential features of this disease. This picture shows the dissection of the enlarged lymph nodes of both sides of the neck and mediastinum from a case of Hodgkin's disease. Note the discrete nodes. That is one of the characteristic features of the enlarged nodes in this disease. The nodes may become fused by fibrosis due to secondary infection or as the result of X-ray therapy. The latter fact is of interest in connection with Dr. Blakeslee's case because it has been observed at necropsy in the retroperitoneal nodes in cases which have received X-ray treatment.

This slide is the low power appearance shown by the sections removed in 1923. It presents a fairly characteristic appearance of Hodgkin's disease. The deeply stained nuclei are those of the lymphocytes of the invaded lymph nodes. The paler cells are for the most part mononuclear cells, variously interpreted as of endothelial or reticular origin. A few of the giant cells so often described as characteristic of this disease are shown.

The next slide is a high power photomicrograph which brings out the characteristic lobulated nuclear cells more clearly. Also there are lymphoblasts and mononuclear cells of large size associated with reticular hyperplasia.

Next is a photograph of the last biopsy specimen taken last spring, showing essentially the same features.

With regard to the nature of the pathological changes, they present typical histology, easily recognizable, which has been understood for a long time by pathologists, yet the etiology of the process remains a source of discussion and of more or less acrimonious combat. Opinions are at the present time held distinctly in abeyance by the more conservative pathologists as to whether this is an infectious process and deserving the name of lymphogranulomatosis, or whether it is essentially a neoplasm. I will not go into the arguments on the two sides, but suffice it to say that with regard to the involvement of the nervous system, occasional cases have been described in the literature of such extension, chiefly from the retroperitoneal masses. A recent case is described by the late Eugene Fraenkel of Germany, in which the patient came to operation with the preoperative diagnosis of spinal cord tumor. The ordinary signs of Hodgkin's disease were not observed, because it was one of those cases in which the glandular

involvement was retroperitoneal rather than cervical. Fraenkel reviews the involvement of bone in this disease, and observes that the vertebrae as well as the long bones are occasionally invaded. The involvement of the ectodural tissues occurs by direct extension, either through the vertebrae or around the vertebrae. Following X-ray treatment the condition is one of fibrosis with disappearance of the hyperplastic cells which constitute the essential features of the disease. Recurrence in the same location is a variable matter, and recurrences following radiation are more apt to be in some other location, rather than in the one in which post-radiation fibrosis has taken place.

Dr. J. H. Globus said: The case we have before us to-night is an extremely unusual one. Cases of Hodgkin's disease resulting in spinal cord changes are rare, and when a case is presented to you with the clinical course of gradual improvement with the almost return to the normal, it warrants consideration of the case as being extremely uncommon. My experience, as the experience of others, is limited to but a few cases of Hodgkin's disease with involvement of the lymphoid tissue of the epidural space, but a degenerative process in the cord, which occurs in other instances of long and protracted illness. That is, a disease characterized by systemic involvement of the spinal cord. In two cases I have autopsied there was no evidence of increased lymphoid tissue in the epidural space. I recall a case where the entire posterior column was involved and the clinical picture was that of tabes. Of course, at no time was there a question of operative interference, as there was no evidence of local pressure, and it was clinically recognized that one was dealing with a system disease, a degenerative process, secondary to a constitutional disturbance. I am familiar with the case reported by Eugene Fraenkel of Hamburg, and there are other instances of the same character where there was actual involvement or increase in the epidural lymphoid tissue simulating tumor formation. Such tumors of course are not a common accompaniment of Hodgkin's disease. They usually occur in a multiplicity of sites, and for that reason present disseminated signs. They therefore do not present the sensory level shown in the case presented to-night. This is another reason for considering the case as an unique and very instructive one.

Dr. Riley: I should like to ask (it must have come up for consideration) whether this patient should have been operated on rather than treated by X-ray. I should like to know why the decision was reached not to remove the tissue. I imagine it could be done, rather than to try the slower and possibly not so complete means of therapy by X-ray.

Dr. Abrahamson said: I recently had a case of Hodgkin's disease, verified by the microscopical examination of a gland. He later developed jaundice, abdominal pains, headaches, and then a progressive hemiplegia with aphasia. All agreed that we were dealing with a Hodgkin's deposit within the brain. An autopsy was refused.

Dr. Blakeslee (closing the discussion) said: In answer to Dr. Riley, as to the method of treatment, it seems to me that the treatment of Hodgkin's disease has been going through certain phases for a great many years. Several years ago vaccine treatment was tried, then salvarsan was used, and this has been followed by X-ray and radium therapy. Surgery seems to have been practiced less frequently in recent years.

The decision to use X-ray treatment in this case I think was a good one because of the excellent results in the treatment of the adenopathy prior to the onset of the compression myelitis.

PERSONALITY MAKE-UP OF EPILEPTICS

J. Notkin, M.D.

[Author's Abstract]

In 1919, in a paper presented at the convention of the American Psychopathological Association, L. Pierce Clark put the question: "Is Essential Epilepsy a Life Reaction Disorder?" and answered it in the affirmative. He went into the details of the personality make-up of epileptics and tried to show that it is a specific one. He enumerated the well known traits of egocentricity, supersensitiveness, noted the emotional poverty and the stiffness of mentation. He further asserted that the character faults of the epileptics are present even before manifestation of seizures; he spoke of increasing slowness and diminished capacity for any kind of activity long before the epileptic disorder manifested itself. In recent years he formulated the conception that epilepsy should be looked at more from a psychobiological aspect, and regarded it as an outflow from a homosexual component which is not sublimated or accepted. He considered the epileptic make-up as being deep rooted in narcism which results from poorly repressed homosexuality. He claims that the extraverted sexual life of epileptics ceases somewhere between twenty-five and thirty years of age and the whole libido is then focussed upon the ego, making larger and larger the innate narcism.

MacCurdy, who made an extensive study of epileptic deterioration, concurs generally with the early conceptions of Clark. In Europe, Franziska Minkowska, in an article contributed in the Festschrift on the occasion of the twenty-fifth anniversary of the professorship of Eugene Bleuler, advocated, alongside with the schizoid and syntoid type of personality, a third one which she called the epileptoid. However, making a study of epileptic heredity rather than of the epileptic make-up, she never went into details of the character traits and generally spoke of already full fledged epileptics. Otherwise, there is very little in the literature in regard to this problem except for Fischer and Kretschmer, who both casually remarked on the occurrence of the benign type of personality, and the schizoid make-up in epileptics.

We have had an opportunity to go into the make-up of non-psychotic epileptics in a general hospital (New York Post-Graduate

Neurological Clinic) and we were surprised to find in a great majority of cases nothing or very little of the so-called epileptic make-up. We then decided to review the epileptic material at the Manhattan State Hospital, and we selected a group of 150 cases—seventy-five men and seventy-five women—where a more or less reliable life history was available. Here again we were impressed with the frequent occurrence of benign type of personality in epileptics. We attempted then to tabulate various factors in each case and see if there was any correlation between them and the personality make-up, and as we progressed we were surprised to find that the age of onset of the first convulsive seizure has apparently a direct bearing on the type of personality. When ever the convulsive seizure appeared in infancy or early childhood the make-up was decidedly an epileptoid one, and the more remote from infancy is the first manifestation of epilepsy, the more benign the make-up. So we had pure epileptoid traits in 16.6 per cent of the cases with the onset of convulsive seizures up to the age of twelve. And even in this group we had a small number with an admixture of a few benign traits and a few with a pure syntonic personality make-up—usually cases in which the convulsive seizures were very infrequent or with intervals of many years' duration. With the onset above the age of twelve, and in single cases below that age, we found in 19.3 per cent of the epileptics a normal make-up up to the first manifestation of the epileptic disorder and then a change to an epileptoid, and in 8 per cent a change to a schizoid type of personality. Then followed a small group with a syntonic type of personality with a slight admixture of epileptoid or schizoid traits (4.6 per cent). The majority in this group had their onset after the age of twelve, and a few below that age, the latter with infrequent seizures—a fact to which we have already referred above. Finally, we have the largest group, making 37.3 per cent out of the total number with a pure syntonic type of personality, all of them except three cases, with the onset of convulsive seizures after the age of thirteen. It is interesting to point out the definite alcoholic history in a good number of these cases. Not uninteresting also is the occurrence in about 8.0 per cent of pure schizoid types where the epileptic manifestation appeared between the ages of eleven and fifty-four, and of a small number (4.0 per cent) with pure traits of psychopathic personality. It would be idle to draw any conclusion; but one perhaps may be justified to look for an explanation in the occurrence of these various types of personality in epileptics in the fact that in those cases which developed epilepsy in early infancy or childhood there was very little time left for the epileptic to develop a personality, and what we really have then is the epileptic mental reaction. This may be substantiated by the striking similarity of these traits in all cases and the more striking resemblance of this reaction with the psychotic traits where irritability, egocentricity, and supersensitiveness reached their limits.

In the cases with the schizoid type of personality we look for the tendency for these individuals to withdraw from the outside world because they are conscious of their affliction. The pure schizoid types

of personality will then easily develop with the onset of convulsive seizures in puberty and later. One must, however, think of the possibility of a primordial schizoid personality which has been awakened and brought to the surface by the epileptic reaction. It is interesting to note that their psychotic reactions are characterized by epileptic traits and an admixture of hallucinatory and delusional elements. With the onset of convulsive manifestations in later years we see an admixture of epileptoid or schizoid traits; the first then would be considered as the result of an epileptic reaction, the second one of the awakening of the latent schizoid tendencies. (The tables have been shown in projection. The paper will appear *in extenso.*)

Discussion: Dr. Osnato said: I think this paper is extremely important. Under the leadership of Dr. Clark there has been a very definite tendency to explain idiopathic epilepsy on the basis of a life reaction, and the tendency has been extended to the point of treating these cases through the psychotherapeutic method of approach on the theory that epileptic seizures constitute simply one portion of the general life reaction based on certain psychopathological situations which have been dilated upon *ad libitum* and sometimes *ad nauseam.* It seems rather clear from Dr. Notkin's paper that the cart has been put before the horse, that they started first with a false premise. If Dr. Notkin's work proves anything, it seems fair to say that his conclusions are two: first, that the so-called epileptic make-up is the result of epileptic seizures, and is therefore the protective reaction of an individual which results in the development of hypersensitiveness and irritability and egocentricity, and not that the epileptic seizures come because the individual is possessed of these personality traits. The second point which Dr. Notkin brought out is that the so-called epileptoid make-up does not make itself manifest in patients who have developed seizures rather late in life, that these show the rather ordinary run of personality make-up, either schizoid, or syntonic, or the normal. It is hard to exaggerate the importance of this work. It brings us rather sharply back again to the more materialistic method of investigation of epilepsy and brings us more in line with the type of work which I think will be fruitful of results.

Dr. S. P. Goodhart said: In your observation of 150 patients, all of whom were subject to institutional treatment and in whom I presume there was a psychosis for which they were brought to the Manhattan State Hospital, was there any common psychic factor which stood out in the cases? For example, would the patient with paranoidal trends or the manic or depressed types show definite variations from the direction of the psychosis, and was there any special feature that appeared to characterize all the groups?

Dr. Notkin will recall a case which I sent to him from Bellevue and now under his direction, where the reaction of the patient was typically hypomanic, though the psychotic state appeared within a very short time following a mild convulsive seizure. The psychotic reaction was not that of the epileptoid equivalent, nor was it of the

post-epileptic state. There was no amnesia, no confusion, but the distinctive flight of ideas and typical manic behavior which brought her to the psychopathic ward at Bellevue Hospital. It would be of interest to us to know if in psychotic episodes the epileptic personality, so-called, really has any distinguishing characteristics. I believe I share the very general opinion among the majority of psychiatrists that this epileptic "personality" is a term to conjure with.

Dr. Joseph Smith said: These personality studies are always interesting. I well remember the late Dr. Hoch presenting years ago a paper before the Neurological Society dealing with studies in manic-depressive conditions and dementia precox, and he came to the conclusion that the make-up of certain persons tends toward the dementia precox type; of others, toward the manic-depressive type of reaction. It was quite absorbing but I do not believe that later observations have tended to substantiate that view or that in all cases it is typically so. The traits here observed should be in reality regarded as symptoms of the disease which does not manifest itself clearly until years after. If you have a manic make-up it is only discovered after the symptoms have become so pronounced that a differentiation from dementia precox is easy. Then you discover in the patient's previous history certain traits which you name constitutional manic or schizoid traits. These things are interesting but they throw little light on the subject. A more fundamental question is, To what earlier "constitution" do these later traits owe their existence? In many cases of epilepsy we would consider that reactions have a great deal to do with situation in life, with environment, and educational *niveau*. Since these vary markedly, the personality make-up will vary likewise tremendously, and one cannot in an off-hand manner divide the epilepsies into two great groups, the manic and schizoid. The characteristics of individuals go far beyond any limits set up by classifications.

Dr. Philip R. Lehrman said: I should like to know if Dr. Notkin has made individual studies of these patients. How did he arrive at the conclusions? Were they made by mass studies, or did he go into personal studies, after the manner of Dr. Clark?

Dr. Charles Bernstein said: I was greatly interested in this paper. About two or three months ago in Syracuse we had an admirable paper, a review by Dr. Duren of the Syracuse State School on the subject of epilepsy, which greatly interested us. Some of the men insisted that we must get back to some sort of organic and physiologic basis for the epileptics, and I am sure it would be worth your time to read this paper by Dr. Duren. Our interest in epilepsy is not so great at the Rome State School as we have only twenty to thirty at any one time, but I have been interested in this attempt to hitch on to the epileptic an epileptic personality. Wherever we see these epileptics handled young and trained individually in an interest in life (and not allowed to deteriorate as so many of them do when they are

held in large numbers in institutions) and given vocational training and an opportunity for natural human activity, we do not see this so-called epileptic personality or irritability and all sorts of excessive sensitiveness develop. If they have the opportunity to be active along normal lines, as normal children are, and if you can keep them active, they do not show these definite personality traits.

Dr. Notkin (closing the discussion) said: I think I should have to refer to the tables to answer Dr. Goodhart. In the cases where the seizures were infrequent or came on later in life, we see very little or practically none of the epileptic make-up. On the other hand, as it was pointed out, we see these traits in cases with the onset of epileptic manifestation in infancy. I know the particular case which Dr. Goodhart referred to, and I must say that she shows a few traits of the epileptic make-up, or perhaps what would be called the epileptic mental reaction. She is always insisting on certain things; making all kinds of demands of the physician. However, I have not had much of an opportunity to make a detailed study of her so far.

In answer to Dr. Lehrman's question, I must say that the study was based on the life histories and observation and examination of each individual case. I cannot go into the details in this paper because it would take up too much time. We did not analyze each single case but we tried to go into details into their adjustment in life. Where the history seemed to be insufficient the Social Service Department of the hospital helped us in securing further additional data. Relatives or friends of the patients have been invited to the hospital for the same purpose; and this, together with the study of the patient, made the material for this paper.

MEDULLARY AND PONTINE SYNDROMES

Rubin A. Gerber, M.D.
(by invitation)

[Author's Abstract]

This paper, essentially clinical in character, correlates the symptomatology and clinical findings in several cases of medullary and pontine lesions with the anatomico-physiological characteristics of the brain stem. A brief review of the anatomy and physiology of the chief motor and sensory fiber tracts and the origin and course of the cranial nuclei and their interrelationship is utilized to point out the diagnostic criteria available in interruption of physiological function of these parts; also a few embryological considerations to point out the teleological mechanism which resulted in the localization of important nerve centers in the pons and medulla.

The first case described shows the syndrome of the nucleus ambiguus and the nucleus hypoglossus (syndrome of Tabia—syndrome of Horner). A man, fifty-four, complained of inability to swallow and a drooping of the right eyelid, which came on suddenly.

Subsequently, his tongue became thick and he was unable to speak or swallow. Speech returned, but swallowing of liquids was very difficult, with regurgitation through the nose. The important neurological findings were limited to the cranial nerve disturbances of the 10th and 12th and reflexes, motor and sensory examination of the extremities being essentially negative. The right palate and right side of the tongue were affected. There was the additional complicating factor of right enophthalmos, myosis, and ptosis.

The fundi showed some senile perimacular changes and some angiosclerosis. Cocaine dilated the left eye widely, the right much less. The left vocal chord was involved. Fluoroscopic examination of the esophagus showed an apparently partial obstruction in the upper esophagus, with moderate dilation above this point. Blood pressure was 100/78; laboratory tests negative. Patient became progressively worse and died of some pulmonary complication early in January, 1926.

Comment: The lesion in this case was probably one of thrombosis, affecting the medulla. The involvement of the hypoglossal and vagus nerves explains the tongue and palate symptoms; and with the lesion extending dorsally to include the pupillary center of the medulla gives us the syndrome of Horner—the ipsilateral enophthalmos, myosis, and sympathetic ptosis. The X-ray findings are readily interpreted as the result of slight failure in the action of the musculature of the upper portion of the esophagus, inervated, as the larynx, by the vagus. Thus the entire symptom complex is explainable. In the absence of all sensory or other motor symptoms, the absence of any peripheral lesion of the 12th and 10th in their peripheral course at the cervical level and the fact of the simultaneous involvement of the 10th and 12th, point to the localization as occurring in the medulla oblongata.

Case of syndrome of the nucleus ambiguus and spinal fillet complicated by syndrome of Horner (the syndrome of Avellis). This patient, a man, fifty-six, noted a closing of the left eye, and the following day difficulty in swallowing, with regurgitation of fluids through the nose. His voice changed to a whisper. On March 18th he noticed that the wind blowing in through the window of his room felt differently on the right side of his face than on the left; on the right side, a warm sensation; and when bathing, cold water felt warm on the right side of his face and the right upper and lower extremities. A few days following the onset of his symptoms fluids ceased to regurgitate through the nose and he swallowed with less difficulty. The essential findings were limited to the sensory and cranial nerve status. These showed the classical loss of pain and temperature sense in the right arm, and diminution of pains and temperature sense over the right trigeminal area. The fundi showed some angiosclerosis. There was the additional complicating Horner's syndrome, on the left. The uvula pointed to the right. There was a paresis of the left palate, with an impairment of the left pharyngeal reflex. Laryngoscopic examination showed almost total immobility of the left side of the larynx with impairment of swallowing. There was

an increased secretion of tears of the left eye. Perspiration following a hot bath showed very profusely on the right side of the face and very little on the left. A 4 per cent solution of cocaine produced very marked dilation of the right pupil with exophthalmos and widening of the palpebral fissure, and no change in the left eye. The heart rate ranged between 80 and 108. Blood pressure was 180/100. Laboratory tests were all normal.

Comment: The lesion in this case was probably one of hemorrhage in the radicular branches supplying the medulla oblongata. This is definitely borne out by the fact of the simultaneous involvement of the nucleus ambiguus, the supply of the larynx and palate and the spinothalamic tract (spinal fillet) which lie close together in the lateral white column and are susceptible to the damage caused by a small lesion. So we have the loss of pain and temperature sensibility in the entire opposite half of the body, including the skin over the scalp to the interauricular line. This constitutes the syndrome of Avellis, in the case complicated by the syndrome of Horner, produced by a slight dorsal extension of the hemorrhage to include the pupillary center.

Case of syndrome of nucleus ambiguus, pyramid and spinal fillet: The patient, a man, forty-eight, complained of difficulty in swallowing, hoarseness, pain in the right side of the larynx, pain in the right pectoral region, and emaciation. The first symptom noted by the patient was pain in the right side of the larynx six months ago. The onset was gradual. The patient believed he was constantly getting better. Additional data showed that there was no difficulty in swallowing and the pain in the right pectoral region was present at the same time as the pain in the right side of the larynx; gradually, also, hoarseness of voice and some difficulty in talking were noted.

Examination: The voluntary motor system showed a definite weakness of the right arm and leg; right greater than left reflexes and a transient clonus both right and left, the right more enduring. Sensory examination showed no objective changes, except that the left pain sense was slightly less than the right; temperature sense was normal; other modalities normal. Pupils reacted to light and accommodation promptly. There was an old left external strabismus. Uvula pointed to the left. There were no marked differences in the motion of the palate, though there was greater elevation on the left than on the right. Also the muscles going from the palate to the fauces on the left showed greater contractile power than those on the right. All other cranial nerves were normal. The fundi were normal; blood pressure 138/90. Subsequent examination disclosed practically the same finding in the palate and vocal chord, motor and sensory examination. At a later date the temperature seemed to be better interpreted on the right than on the left, but no distinct loss was present. X-ray and laboratory tests done at other institutions were all said to be negative. A special laryngeal examination showed a left-sided vocal chord paralysis present.

Comment: The above case does not clearly indicate the etiological factor responsible for the condition. There is some likelihood of

thrombosis, as there was no marked disturbance in consciousness and as the lesion seemed to come on gradually. Apparently, the involvement of the spinal fillet is not of a very grave character. The findings though distinct were not the typical complete loss of pain and temperature that follow in lesions of the spinal fillet. That of the palate and vocal chord was permanent and decisive. The affection of the nucleus ambiguus and the spinothalamic easily occur conjointly when it is recalled that they lie close together in the lateral white column of the medulla. We have a complicating factor in this case in the involvement also of the pyramidal tract. The lesion is probably in one of the radicular arteries supplying the medulla, which may easily cause the picture given above as regards the syndrome of Avellis—characterized by the laryngoplegia and palatoplegia associated with a contralateral pain and temperature disturbance. Perhaps an additional lesion must account for the pyramidal tract finding.

Case of syndrome of the vestibular nucleus. The patient, a man, aged forty-nine, complained of attacks of vertigo which began about a week ago after an interval of five years during which there were none. He also complained of " noises in the right ear " during attack. He had similar attack about five years ago. Previous to his first attack, he had had an attack of pneumonia which left, as a sequel, cardiac disease. He subsequently suffered attacks of vertigo on and off for two years. His general neurological status was completely negative with the exception of beginning vertigo when he was about to lie down. A few nystagmoid jerks were noted. His disks were noted as being very pale. Bone conduction was greater than air conduction equally on right and left. There was no middle ear condition. The blood pressure was 110/60. The pulse 82, occasionally intermittent, the irregularity occurring about every six to ten beats. The history and description of acute attacks were confirmed by a relative, who described the acute paroxysm minutely, stating that the patient became very pale with moist, clammy perspiration on his forehead, and complained of being very dizzy, with the bed turning round and round. Occasionally he would vomit. It would take three or four days before he felt well enough to resume his usual work.

Comment: From the acute paroxysmal nature of the disease, one would infer a transitory lesion especially as there is complete good health between the attacks. The etiological factor is probably in the nature of an angiospasm in the region of the vestibular nucleus in the medulla. Since the sense of hearing is implicated one would think of Meniere's disease but there is only the slight change in that bone conduction seems to be greater than air conduction both on the right and left. There is, however, no evidence of middle or internal ear disease, though the symptoms are exactly similar in the latter disease. The vestibular area of the medulla is abundantly supplied by blood vessels, and one can easily think of a probable angiospasm as the cause of the vertigo. There were no other special or neurological findings, except that of lost equilibratory control. This fact in the absence of internal ear involvement argues for the diagnosis

of medullary involvement especially when the cardiac condition is taken into consideration.

Case of abducent alternate hemiplegia. Pontine syndromes are particularly charterized by the alternate character of the lesion. A child, aged four years, presented a paralysis of the left external rectus muscle coming on one week before, after an attack of measles. This was apparently sudden in onset and no change was noticed since the onset. There were no other illnesses or abnormalities.

Examination showed right reflexes uniformly increased over left; right Babinski and right Chaddock. Sensation was normal. Of the cranial nerves only the presence of the left external paralysis was noted. The fundi were normal. Dr. Reder's report of the eye condition confirmed the left external rectus palsy with diplopia which increased as the patient looked outward to the left. Tested with light the diplopia in a horizontal direction became wider and wider apart in reference to images. There was no error in refraction. The paralysis was reported as a convergent squint due to paralysis of the sixth nerve. The limitation of motion is to the midline only (in refractive errors the eye goes outward).

Diagnosis: "Non-refractive convergent squint due to paralysis of the sixth nerve. Right eye normal in every particular."

Comment: The etiological factor here is probably the toxemia attendant on the measles. This toxemia probably produced a thrombosis in the caudal portion of the pons. A small lesion here would involve both the emergent fibers of the sixth nerve and the pyramidal tract giving us a syndrome of alternate abducent hemiplegia. (The author here diverts to make some remarks about nomenclature, concerning which there is a little confusion. He believes it were best if no definite names were attached to the syndromes other than the anatomical designation of the site of insult). Millard-Gübler syndrome is the name sometimes given to this condition. But Bing reserves this name for the picture when it is further complicated by facial paralysis on the same side as the abducent. Tilney speaks of several variations of the abducent syndrome, one of which is with the involvement of the facial. In contrast to Tilney, who reserves the title Millard-Gübler syndrome for the pure hemiplegia alternans facialis, Jelliffe and White delimit the Millard-Gübler syndrome to a contralateral hemiplegia of the trunk and extremities without inferior facial palsy, without hemianesthesia and without the syndrome of Foville, with alternate paralysis of the 6th nerve alone, or 6th and 7th if the lesion extends laterally. The author further states that it is also possible in reference to the facial form of alternate hemiplegia, to have a nondegenerative form both of the facial and extremity paralysis. In such a case, though rare, it is true, the lesion is so situated that neither the facial nucleus nor the issuing root is involved; instead, the central tract shortly before its entry into the nucleus, and this immediately after it has crossed the midline and entered on the side of the lesion. Thus cases of supranuclear involvement of the facial nerve associated with paralysis of the opposite extremity are readily visualized.

Cases of hemiplegia alternans hypoglossus et facialis. The following cases illustrate the variation of the alternate facial hemiplegias and complicating factors. A man, fifty-five, complained of difficulty in walking and weakness in the right leg. He had no difficulty in swallowing, but some slight difficulty in talking clearly.

Examination: A definite left facial weakness, ataxic gait, with dragging of the right foot; reduced associated movement of the right arm in walking, were readily noted, and a right hemiplegia. No R. D. was present in any of the muscles of either the right or left extremity. Sensory examination was completely negative. There were evidences of marked arteriosclerosis. Arcus senilis was present. The facial showed the left nasolabial fold less marked than the right and the angle of the mouth lower on the left than on the right. The upper branch was apparently normal. There was an indefinite diminution of movement of the palate on the right during phonation. The hypoglossal nerve showed involvement. The tongue deviated to the left, and showed some corrugations on the left, with the left half smaller than the right. Blood pressure was 220/110. The various laboratory tests were all negative; Barany tests, normal.

Comment: The lesion here was undoubtedly a hemorrhage, and this is borne out by the arteriosclerotic changes in the vessels and the high blood pressure. The site of the lesion is in the medulla on the left side involving the left pyramid and the left hypoglossal nucleus. The pyramids subsequently decussating give the paralysis on the right side while the left side of the tongue was affected. We have here a further slight complication in the facial of the left side, which is the lower two-third variety and which the patient has never previously noted. Whether it is the residual of some old condition it is hard to say as there was no R. D. It is more likely that there may have been a progression of the symptoms with the lesion extending across the midline, or it may be an irritative or pressure phenomenon due to interference with the circulation in the region of the facial.

Case of hemiplegia alternans facialis complicated by subsequent ipsilateral hemiplegia. Another case which shows the continuity of the etiological factors in producing ever extending lesions is cited: A woman, fifty-four, complained of twitchings all over the body, general nervousness, shooting pains in the head, hot flushes all the time, though these latter first began five years ago and are worse now. Particularly she complained of dizziness, saying she could not turn in bed; everything would turn around her and she would feel nauseated. When walking she would fall over to the right more than to the left and had to be careful of her gait. Her first symptom was dizziness which has been gradually getting worse.

Examination: She held her head rather stifly and though walking normally, was guarded in her steps and walked slowly. Coördination tests were normal. The reflexes showed an increase on left over right. The abdominals could not be elicited because of patient's obesity. There was a questionable Babinski on the left, none on the right, but fanning was present, both right and left. All confirma-

tory signs were absent. Hoffman was present both right and left. Sensory examination was negative. The fundi showed evidences of arteriosclerosis. Right palpebral fissure showed greater than the left. The 7th showed a right lower facial paresis. General systemic examination noted the obesity, pulse rate of 84, blood pressure 180/80, hot flush over the face. At subsequent examination on March 26, 1926, there were signs of slight hyperreflexia on the right, greater than on the left. Hoffman was more actively elicited on the right than on the left. Achilles jerk was more active on the right than on the left. The blood pressure was 200/100. Patient complained of the dizziness and said that she had to take a long time to effect any change in posture as the slightest movement and particularly change in posture even to the side was accompanied by severe pains in the head. Laboratory tests were negative with the exception of the urine which showed some slight nephritic condition present.

Comment: In this case the patient undoubtedly had an incomplete facial paralysis on the right with left hemiplegic signs which subsequently showed in addition an ipsilateral hemiplegia. One should be wary of the presenting symptoms. Any organic lesion may be masked by neurotic symptoms. In this case the patient undoubtedly had some of the neurotic symptoms associated with the menopause, such as the hot flushes, nervousness, irritability, etc., but also had grave organic symptoms and findings. The lesion here was hemorrhagic, in the caudal half of the pons, right side, involving the facial fibers and the pyramidal tract. This tract subsequently decussating gave the appearance of paresis on the left side of the body. The sixth nerve is very frequently involved in these lesions but apparently escaped here. However, subsequently another vascular insult was suffered and increasing signs of involvement of the right side were found. There was apparently no nuclear or infranuclear involvement of the facial here.

In his discussion, the writer reviews other interesting syndromes of the pons and medulla, seen in patients who are no longer ambulatory. He discusses hemiplegia cruciata and tetraplegia, pointing out the anatomical basis for these lesions. He makes some remarks concerning the syndrome of the vago accessory and the syndrome of the 10th, 11th and 12th cranial nerves, and the syndrome of the post-inferior cerebellar artery. Of the pontine syndromes, he mentions briefly some lesions of the oculogyric and cephalogyric fibers. After some remarks on extracranial disease, affecting cranial nerves and simulating pontine and medullary syndromes, he reviews some etiological factors present in these conditions and concludes his paper with an outline of some of the important points in differential diagnosis. Finally, he makes a plea for a more definite delimitation of syndromes—a standardized nomenclature, utilizing anatomical designations and the interpretation of not only signs but also symptoms on an anatomico-physiological basis.

Discussion: Dr. Abrahamson said: It is not fair to discuss a paper of which the author has only read fragments. We should

wait and see the paper in full and go over the cases in detail, and examine the description of the clinical syndromes. I think Dr. Gerber has an unusual group of cases.

Dr. Osnato said: It is difficult to make this material interesting or to make a presentation of it attractive, especially when one is pressed for time. The paper is extremely well and carefully written, and will be very much worth while reading. Just one practical point: the organic neurologist is useful to the otologist and laryngologist in just this type of case. In the case where the esophagus was involved as part of the syndrome, a provisional diagnosis of carcinoma of the esophagus had been made, and it was only after the patient had been studied from the neurological standpoint that the real condition was understood. When Dr. Blakeslee sent over to the nose and throat men a diagnosis of syndrome of Avellis they came over in droves; they did not know what it meant, and they were extremely interested. In that particular case the diagnosis of tuberculosis of the larynx was the provisional diagnosis, so that the organic neurologist plays a very important rôle in aiding the men in other specialties in the diagnosis of these conditions.

Current Literature

I. VEGETATIVE NEUROLOGY.

1. VEGETATIVE NERVOUS SYSTEM.

Martini, T. Intermittent Gastroptosis. [Semana Méd., Vol. XXXI, Jan. 3. J. A. M. A.]

Martini describes here the symtoms and treatment of what he calls orthodigestive dolichogastria. The stomach sags and stretches with otherwise normal digestion. There is no actual pain with this intermittent form, but the sensations of oppression and weight, the drowsiness, dyspnea and eructations from the muscular atony may be accompanied by secretory disturbances and lack of appetite. The prognosis grows graver with every day that treatment is postponed, as the intermittent gastroptosis soon becomes chronic. Treatment must combat the various factors involved, the asthenia, inherited taints, etc.; mechanical supports are useful, and measures to strengthen the abdominal and gastric walls, fatten the patient and give tone to the nervous system. He advises also fractioning the meals, reclining afterward with the pelvis raised, and refraining from fluids at meals. Psychotherapy must not be forgotten.

Santenoise, D. The Solar Reflex. [C. R. Soc. Biol. 88, 1142.]

The solar reflex first studied by Laignel-Lavastine, Thomas, and Claude, which consists in a diminution of the amplitude of the pulse during and after compression of the region of the solar plexus is here reported upon. The reflex indicates increased tonus of the sympathetic, and is of clinical value especially in the absence of the oculocardiac reflex. The stomach should be empty when the test is made.

Santenoise, D,, and Codet, H. The Solar Reflex. [Progrés Médical, Vol. XXXIX, May 31. J. A. M. A.]

Santenoise and Codet advise testing the tonus of the sympathetic by means of the solar reflex. The fasting subject lies on his back with open mouth, breathing freely but without forced movements. A sphygmomanometer (preferably with recording attachment) is applied to his arm. The physician compresses with both hands the middle epigastric region, pushing it toward the diaphragm. The reflex is positive if the oscillations of the pulse diminish. This sign of increased sympathetic tonus occurs in persons with vasomotor instability, paroxysmal secretory disturbances,

and palpitations, such as are most marked in exophthalmic goiter and in the menopause.

Philippsthal. Epigastric Neuralgia. [Deutsche med. Woch., Sept. 21, Vol. XLIX.]

A clinical study of ten patients with epigastric pains resembling those of gastric ordnodenal ulcer. Injection of procain into the painful spot gave relief and is held to be a differential indication of a nonsomatic process. Addition of alcohol cured two, while five were refractory to all measures until relieved by excision of the painful spot, the seat of the neuralgia. In two of the cases, asthma accompanied the attacks and subsided at the same time (after operation in one case, conservative treatment in the other).

Soupault, R. Drug Dissociation of Vital Centers. [Presse Méd., Vol. XXXI, April 25. J. A. M. A.]

Soupault reports a case in which intraspinal anesthetization with procain arrested completely the functioning of the respiratory center. The blood pressure and circulation were only very slightly modified. Under artificial respiration the drug was eliminated enough so that the paralysis of the respiratory center was finally overcome, and natural respiration began anew the forty-fifth minute. This confirms on man the dissociation of the bulbar centers realized in dogs by injection of chloralose into the region. In the animals and in this clinical case, consciousness was unimpaired. The man complained that the pressure on the ribs hurt him, and the dogs dodged when threatened with a blow. As the patient resumed spontaneous but sluggish respiration, a brief convulsion occurred, and recurred six or eight times in the following four hours. Soupault interprets the convulsions as indicating that respiration was not adequate at first. The whole experience teaches the importance of artificial respiration in mishaps with anesthetics. Instead of wasting time on other measures, artificial respiration should be started at once, and kept up regularly as long as needed.

Shawe, R. C. Communication Between Vagus and Cervical Sympathetic. [Lancet, March 29, 1924. J. A. M. A.]

Shawe describes some connections which pass between the inferior and middle cervical sympathetic ganglia and the vagus nerve with its branch, the recurrent laryngeal—including their detailed distribution, which appear to have hitherto escaped particular notice—and draws attention to the clinical aspects of these associations. From the clinical side it appears that the importance of these vagosympathetic fibers depends on their two main spheres of distribution: (1) to the cardioaortic region, and (2) to the thyroid gland. In the former association they mediate, at least in some cases, as shown by the success of Jonnesco's operation, the critical nervous impulses of angina pectoris, transmitting the afferent

stimuli from the heart and aorta, and very probably transmitting efferent stimuli to that region. These nerves form a concentration point for the sympathetic cardiac fibers from the upper dorsal segments, and as such present a readily accessible isthmus at which to attack the vicious cycle of irritation by surgical methods. In the latter association these same communicating nerves probably mediate secreting fibers to the thyroid, and it is the pathologic hyperexcitability of such fibers which may form a most important etiologic factor in the production of exophthalmic goiter; consequently, in suitable cases, in association with the other cervical sympathetic ganglia, their extirpation would appear to be justified in this disease as judged by the results of Jonnesco's work.

Daniélopolu, D., and Carniol, A. Oculogastric Reflex. [Arch. Mal. l'App. Digestif, Feb., 1924.]

These authors find that like the oculocardiac syndrome there is also a gastric motor inhibition brought on by light pressure upon the eyeballs. Both signs can therefore be brought out at the same time.

Schroeder, C. B. Blocking Nerve in Whooping Cough. [Kl. Woch., Vol. II, Aug. 13. J. A. M. A.]

Schroeder had bad results with injection of alcohol into the superior laryngeal nerve in children suffering from whooping cough.

Hustinx. Blocking the Splanchnic Nerve. [Ned. Tijd. v. Gen., Aug. 11, 1923. J. A. M. A.]

Hustinx adds 119 cases to those on record which brings to 1,375 the number of operations done under anesthesia of the splanchnic nerves in the last two or three years. Four deaths have been recorded. The Braun technic is more certain, but the Kappis technic anesthetizes all viscera above the pelvis. A combination of the two seems to be preferable. Complications on the part of the respiratory organs are reduced to the minimum, but are not entirely done away with. The needle must be fully 14 cm. long, and it is a great improvement to introduce it in a sheath, pushing the tip beyond the sheath only at the deepest point.

Westphal, K. Nervous Influence of the Motor Processes of the Gall Duct. [Zschr. f. kl. Med., Vol. XCVI, Nos. 1–3.]

Westphal first presents a review of all that has been written in regard to the anatomy and physiology of the gall duct. He then describes his method of investigation by which he is able directly to observe the entire gall canal system in cats, rabbits and guinea pigs. He describes in detail his various experiments and subjects them to criticism. They include electrical and pharmacological stimulation of the vagus and sympathicus. The phenomena observed in the gall duct are facilitation of the gall discharge induced by a slight stimulus of the vagus by electricity or pilocarpin which causes a lively peristalsis; checking of the discharge

even to complete retention of the gall as a result of a strong stimulus which produces spasms chiefly in the region of the portio duodenalis choledochi. Decrease in tonus is caused by paralysis of the vagus by atropin. Stimulus of the splanchnic causes a closing of the sphincter in Vater's papilla and with it relaxation of the duodenal portion of the ductus choledochus as well as of the gall bladder. The strengthened muscular apparatus in the wall of the lower choledochus may be compared functionally with the pylorus portion of the stomach.

Westphal, K. Pain of the Gall Duct and Its Radiating Reflexes. [Zschr. f. kl. Med., Vol. XCVI, Nos. 1–3.]

Westphal reports his findings in 25 cases of disease of the gall duct which received a contrast meal in the attack of pain. A marked increase of motility of the stomach and intestinal musculature was observed in the larger number of cases. The stomach showed widespread spastic states of the entire canalis egestorius, increased contraction of the antrum, pylorus spasm with failure of peristalsis, sometimes even a total gastrospasm. The small intestine gave the picture of hypermotility, the large intestine a spastic collapse. These motor disturbances are brought about through reflexes which originate in the nerve plexa of the gall bladder and of the ductus choledochus. Atropin has a farreaching effect upon these disturbances. Beside the peritoneal tension in the right upper abdomen the stopping of the right dome of the diaphragm frequently observed at the umbilicus is looked upon as a visceromotor reflex. An important differential diagnostic sign for all sorts of diseases of the gall bladder is the latent viscerosensory phrenic reflex, *i.e.*, sensitivity to pressure of the right phrenic nerve at the neck.

Westphal, K. Motor Neurosis of the Gall Duct and Its Relation to the Pathology of the Latter, to Stoppage, Inflammation, Stone Formation, etc. [Zschr. f. kl. Med., Vol. XCVI, Nos. 1–3.]

Westphal by sounding the duodenum confirms in man the results obtained in experiments with animals in regard to the emptying of the gall duct under varying conditions. Aside from pronounced disease of the gall duct there may be heightened stimulability of its musculature in pregnancy, during menstruation and in vegetative neurotics. In investigation with pilocarpin this heightened stimulability manifests itself in an increased initial checking of the discharge of gall. The author finds in these observations more satisfactory explanation of the special disposition of the female sex to diseases of the gall duct than in pressure of corsets or pressure of the enlarging uterus. He considers functional nervous disturbance as the basis for the genesis of stoppage of the gall bladder in its hypertonic or its hypotonic form and as the ground for the result, that is the formation of stones. The latter as well as the muscular hypertrophy of the bladder is considered as due to stoppage which results from incomplete discharge, hypermotor neurosis of the gall duct. This

would probably have its origin, as *e.g.*, in pregnancy, in disturbances of internal secretion and it is probably further determined by a hypercholesteremia such as is found in pregnancy and in arteriosclerotics. The pains in gall colic are due to convulsive peristalsis of the gall duct and reflex contractions in stomach and intestine. Atropin freely administered recommends itself as the best means for combating these, together with hot cataplasms and medication with olive oil.

Peritz, G., and Fleischer, F. Spasmophilia in Gastric Ulcer. [Arch. f. Verdauungs, Vol. XXXII, p. 243.]

The interrelationships between spasmophilia and gastric ulcer are here emphasized and their fundamental pathology sought for.

Henderson, J. E. Studies in Peristaltic Fatigue. [Am. J. Physiol., LXVI, p. 380.]

If one employs the Trendelenburg method of studying peristalsis in isolated intestinal strips of the guinea pig one finds that on increasing the internal pressure to a certain critical point the strips begin to show peristaltic movements. These waves die out after a longer or shorter time. In many cases, however, the activity is resumed and waves occur in short groups. In these contractions both longitudinal and circular muscles take part. During a quiescent period between the groups, local pinching or other stimulation of the gut sets up a local contraction of circular and longitudinal muscles and is not propagated as a peristaltic wave. Evidently the musculature is contractile and irritable. The lack of propagation must be due to a deficiency in some other structure. Some evidence was presented to show that the mechanism had suffered from fatigue of the ganglionic plexus, and the work of Cannon and Trendelenburg is discussed in the light of these results showing that this too could be explained on this same basis. It was pointed out that the state of tonus did not necessarily determine the presence or absence of the waves. It was further pointed out that the frequency of the peristaltic waves did not depend on the length of the strips as suggested by Trendelenburg, but was due to some other factor. [Author's abstract.]

Morison, J. M. W. Elevation of the Diaphragm: Unilateral Phrenic Paralysis. [Arch. Radiol. and Elec., Vol. XXVII, 353; Vol. XXVIII, 72. B. M. J.]

The author discusses the differential diagnosis of elevation of the diaphragm. A temporary elevation, he explains, is frequently caused by gaseous distension of the stomach, and is often seen in carcinoma of that organ. It differs from the permanent variety in that the movements of the affected leaflet are never reversed—that is to say, there is no paralysis. Permanent elevation may be congenital or acquired. Loss of movement of the chest wall at the base and apex of the lung suggests that there is congenital unilateral paralysis of the diaphragm, whereas increase of movement on one side suggests an acquired corresponding condition.

That movements are not lost on the affected side in the acquired type is due to expansion of normal lung and to the use of extraordinary muscles of respiration. The causal condition may be injury or disease. The author points out that Petit's eventration and unilateral phrenic paralysis are indistinguishable apart from a definite lesion of the phrenic nerve. Permanent elevation of the diaphragm is to be differentiated from (a) herniæ, (b) localized hydro- and pyo-pneumothorax, (c) subphrenic or subhepatic abscess. In herniæ the X-rays show an elevated irregular broken line extending across the hemithorax; underneath this line lung tissue may or may not be seen. The stomach contents may reach above the line of the cardia, palpation of the abdomen producing a rippling of the surface. In small herniæ reversed movements during respiration are seen, but movements may be absent in large herniæ. The author does not lay much diagnostic stress on the presence or absence of the colon in the pciture: it may be present or absent in both herniæ and eventration. Of the utmost importance is examination of the stomach by the bismuth meal, which should settle the diagnosis. Hydro- or pyo-pneumothorax and subphrenic or subphepatic abscess should cause little difficulty. In all of them the X-ray picture will easily reveal the condition present, the differential diagnosis from Petit's eventration resting on the presence in the latter of an unbroken bow line extending high into the thorax with reversed movements unless adhesions have formed. In eventration, also, the level of free fluid in the stomach is that of the cardia, and the bismuth meal will reveal the gastric deformities so frequently present in the condition.

Santenoise, D. Periodicity in Vegetative Nervous System. [Presse Méd., Vol. XXXI, April 25.]

This author has followed some of the newer work on the vegetative nervous systems and finds certain close interrelationships between the oculocardiac reflex, the hemoclastic crisis, the solar reflex and certain drug tests. He suggests that in periodic psychoses the balance in the vegetative nervous system is seriously upset. Symptoms of vagotonia accompanied paroxysms of acute mania or psychoses of dread.

Bachlechner, K. Blocking the Splanchnic Nerve. [Zeit. f. Chir., Vol. CLXXXVI, Feb. 9. J. A. M. A.]

Bachlechner reports his experience in 600 cases of splanchnicus anesthesia (Braun). He found the method harmless. Operations on the upper abdomen (stomach, gallbladder) are entirely painless. No accidents occurred. He observed no cases of collapse even in the most difficult operations. He has never observed that the method caused any considerable lowering of the blood pressure, as has been reported by some. Failures are due in many cases to the inadequate anesthesia brought about in the abdominal walls.

Balan, N. P. So-called Pylorospasm in Infants. [Archiv f. Kinderheilkunde, Vol. LXXIV, April 5, p. 81.]

This observer finds that in pylorospasm of infants, based on seven cases, that the whole of the pylorus canal except the actual pylorus ring itself is involved. Both musculature and elastic tissue were much hypertrophied, and the hypertrophy increased with the duration of the spasm. Hypertrophy, therefore, is the consequence, not the cause, of the spasm. Changes in the mucosa in the pylorus region accompanied the reflex spasm in a few cases; in the others, innervation factors alone were analyzable.

Hannemann, K. Spastic Constipation. [Münch. med. Woch., April 4, Vol. LXXI. J. A. M. A.]

Hannemann presents arguments to show that a neurotic overexcitability is the primary factor in spastic constipation. Psychotherapy is the rational treatment, and has proved astonishingly successful in his hands. He has returned to the method of simple suggestion as published by Bernheim in 1892 and Forel in 1911, and only exceptionally resorts to hypnosis, catharsis or psychanalysis methods. In case of doubt as to the exact nature of the constipation, whether atony or spasm is the predominating factor, an adductor sign he describes turns the scale. He lifts with both hands one leg of the reclining patient, flexes the leg, and tries to abduct it, telling the patient to relax his muscles. There is no resistance in normal subjects, but almost invariably in the spastic constipation cases the adductors are contracted so that abduction is almost impossible. In some cases the foot of the other, the horizontal leg, spontaneously twists inward at the same time. This adductor sign indicates extreme motor excitability which includes the intestines, readily explaining the spastic constipation, and the benefit from treatment of the neurotic predisposition. The same method of treatment has proved remarkedly successful in other conditions in which neurotic-functional influences are at work, as for instance, Heyer's success in curing gastroptosis with psychotherapy. He describes a few typical cases, saying that spastic constipation is encountered in men almost as often as in women. The intensity of the adductor sign is a gage of the severity of the spastic condition in the bowels, and it subsides parallel to the subsidence of the clinical and roentgen-ray findings typical of spastic constipation.

Pipping, W. Intestinal Infantilism. [Finska Läk. Hand., Oct., Vol. LXXV, p. 492. J. A. M. A.]

Pipping describes the clinical picture of the severe chronic insufficiency of the digestive apparatus, in children past babyhood, which Herter calls intestinal infantilism. Pipping has encountered five cases in the last five years, and one was in the children's hospital for three years. Nothing suggesting inflammation was found in the intestines at necropsy, in one typical case. The pathologic findings were dilatation of the ventricles and

fatty degeneration of the liver, with anemia of all the organs, and acute pneumonia. The extremely chronic course of the intestinal symptoms; the fluctuations in the weight, independent of external causes; the development of edema of neither cardiac nor renal origin; the lack of any influence from dietetic measures—all testify to a constitutional endogenous factor. Two of the six children had severe attacks of tetany—which is rare in Finland—with other signs of an intense spasmophilic diathesis; instability of the nervous system was evident in all. One of the children had pains in the hands and feet, insomnia, edema, micturition every half hour, lack of appetite, vomiting and loss of weight and strength, long before the intestinal symptoms became pronounced, and a younger sister presented a similar clinical picture. Only one of the six belonged to the laboring classes, and all were girls, between the ages of two and five. Three have died, from inanition cachexia; they were "unnourishable." Two seem to be improving slightly at present as regards the nervous symptoms, but they will probably be stunted in growth. One of them seems to have nearly recovered; the symptoms had all been milder in this case. She improved on a diet of skimmed milk and meat juice at first, but the hemoglobin percentage was 40 (Sahli) on leaving the hospital after a year's stay.

Livingston, Edward M. Studies of Viscerosensory Phenomena. [J. A. M. A., May 10, Vol. LXXXIII.]

This study is based on fifty cases diagnosed clinically as acute cholelithiasis or acute cholecystitis. Thirty-one of these came to operation. Twenty of the thirty-one patients that were operated on had positive skin signs, two had negative skin signs, and nine had no sensory tests. In other words, with but two exceptions all tested patients had positive cutaneous hyperesthesia. The first negative patient was a woman having both gallstones and kidney stones as concomitant findings, the skin signs being negative for cholelithiasis and positive for nephrolithiasis. The other negative patient was a woman who entered the hospital without acute colic but on account of a gradually deepening jaundice of three weeks' duration. A preoperative diagnosis was made of carcinoma of the head of the pancreas or impacted common duct stone. Operation disclosed the latter. Skin signs would not be expected in such a case on account of the long duration of the complaint, the lack of an acute colic, and the operative findings. An analysis of the thirty-one operative cases of acute biliary disease shows further that localized skin signs are as constant and valuable as any other signs or symptoms of this disease. Characteristic pain was noted in nineteen cases, eructations of gas in nine, vomiting in twenty-four, constipation in seven, jaundice in thirteen, hematamesis in none, typical tenderness in thirteen, abdominal rigidity in nineteen, a mass in eight, positive skin signs in twenty, and positive roentgen-ray findings in nine. If these data are reliable it would seem

that a dictum might be made concerning the most uniform of these signs and symptoms. It may ordinarily be concluded that a history of acute pain in the right upper abdominal quadrant associated with vomiting and abdominal rigidity constitutes a combination of symptoms pointing definitely to acute biliary disease, but that if localized cutaneous hyperesthesia is superimposed, the diagnosis is almost certain. In biliary colic, it may be concluded that: In acute cholelithiasis and acute cholecystitis, localized skin signs uniformly develop during the attack. In cases with negative skin signs or with skin signs present elsewhere, the condition is not a simple acute disease of the gallbladder. In renal colic it is concluded that: The viscerosensory phenomena may be produced at will for study or demonstration by a sufficient distention of the ureter and kidney pelvis. A triangular area of skin on the inner and upper portion of the thigh is here suggested as being of value, from a clinical standpoint, in determining cases of intraureteral tension. A few isolated cases of acute nephrolithiasis are reported. It is emphasized, in conclusion, that acute distention within the appendix, biliary ducts and ureter uniformly produces localized cutaneous hyperesthesia. Tests for this hyperesthesia should be made with the grosser forms of stimuli, and a vigorous twisting pinch is the most reliable method of examination. Localized hyperesthesia, when properly correlated with the other clinical data present, is of great importance in the differential diagnosis of diseased states of these tubular structures. No physical examination for the diagnosis of acute diseases of the appendix, biliary ducts or ureter is complete without tests for localized cutaneous hyperesthesia.

Bickel, A,, and Watanabe, T. Action of Drugs on Bile. [Deutsche med. Woch., Vol. XLIX, June 29.]

Drugs which act on the sympathetic and parasympathetic systems have little influence on bile secretion according to this report. They have a pronounced influence on the musculature of the ducts however.

Møller, E. Metabolism in Nervous Anorexia. [Uge. f. Laeger., Vol. LXXXVI, Feb. 14, p. 135. J. A. M. A.]

Møller gives figures showing the basal metabolism in four cases of nervous anorexia. With the extreme undernourishment and loss of flesh, bradycardia, chilliness, amenorrhea, constipation and low metabolic rate were pronounced; also low sugar content of the blood, increasing only slightly and very slowly after intake of glucose; with hypotonia, and only slight increase in the blood pressure under epinephrin. One of the patients presented cyanosis of the hands, and one had periods of profuse diuresis. He discusses which of these symptoms can be ascribed to the undernourishment, accepting the amenorrhea as due to this. Nothing to suggest myxedema was observed in any of the cases. His observations justify the conclusion that undernourishment has an influence on the functioning of the endocrine system in whole or in part.

Book Reviews

Alfvén, Johannes. Das Problem der Ermüdung. Eine psychologische Studie. [Verlag von Ferdinand Enke, Stuttgart.]

This small monograph (78 pp.) constitutes Vol. 6 of Moll's "Abhandlungen" dealing with psychotherapy and medical psychology. We have dealt, in these pages, with some of its predecessors and turn to the present work with the anticipation of pleasure which its forerunners have already prepared.

Nor are we altogether disappointed. First, because it is not a series of kymograph tracings of tired muscles—as if muscles were all there was of man. For this relief much thanks; for reviewers are always tired. Fortunately the material before us contains much to intrigue, not a little to stimulate, and perhaps somewhat to combat.

The author announces that he will deal with conditions of psychological fatigue, concerning which he notes some dearth of study. He thus comes first to the fiction of "Neurasthenia." Thumb sketches of the definitions of Westphal, Ziehen, Binswanger, Beard, Oppenheim, Dubois and Dejerine prepare the way to a formulation of the condition of "irritable weakness" which is "psychical" above all things. What is called "physiological fatigue" must first be studied as his next step in the consideration of which unpleasant and goalless work is considered; their fatigue as a protection against monoideal and stereotyped performance. This leads to fatigue and exhaustion.

Nervous fatigue is then discussed as "overinnervation," "tenacity" of work, "repulsion," adaptation and avoidance, and finally negativisms to work, and so on. Unfortunately the author floats on the descriptive surface of his subject and never gets down to grips with the "affectivity" situations in their dynamic setting.

In this respect we find nothing that really helps us although the general discussion has been entertainingly set forth.

Muskens, L. J. J. Epilepsie. Vergleichende Pathogenese, Erscheinungen. Behandlung. Mit 52 Abbildungen. [Julius Springer, Berlin.]

This is a monograph of approximately 400 pages chiefly dealing with the researches of the author upon a variety of phases of the epileptic phenomena. It is a very serious and valuable work, the which to adequately review would involve much more time and space than can be spared. This is to be regretted since any investigator who has spent so many years in painstaking study, as here set forth, should receive a just modicum of praise for his efforts. This we would frankly grant him and say this is the most important con-

tribution to the general subject that has appeared within the past twenty years. The problems are so many, however, so intricate, complex and involved that even this monumental effort falls short of completion. And yet here are certain definite attainments; valid solutions of certain aspects, and foundations for future research.

In the main the emphasis is perceived as dealing with the physiological aspects of the convulsive phenomena. The author's experimental work affords certain platforms, some conclusions which need not be further inquired into and from which future research can proceed.

As a record of over twenty years of continuous preoccupation with the problems much praise is to be accorded. To attempt to recapitulate what the author offers would be a task far beyond the reviewer's capacity.

We can only state that this work is one that every worker in this field will find indispensable. Our own conviction is that twenty such volumes will be needed to completely set forth all of the many-sided intricacies of the epilepsies. This is a sound beginning. Its chief deficiencies as an effort to encompass the whole field, as we see it, lies in the inadequate portrayal of the psychical side of the problems involved. This is not a criticism. Some day, maybe, a supergenius can encompass the total situation. This may be in a decade, a century, or a millenium. We vote for the last, but at all events here is a most sincere and praiseworthy effort, at least, to outline the difficulties, if not offering a solution of them. As a final word we cannot resist offering our thanks for the publisher who gives us this contribution. The least that can be done by neuropsychiaters is to buy the book in recognition of such bravery.

Ferenczi, S., and Rank, Otto. The Development of Psychoanalysis. [Nervous and Mental Disease Publishing Co., New York and Washington.]

This is a short and fascinating monograph (No. 40) which details some of the advances that have been made in psychoanalytic theory and practice in the past thirty years, since Freud in 1893 first published, with Breuer some new ideas about the psychoneuroses.

As with all other aspects of medical science psychoanalysis was not content to rest upon its earlier formulations. In this span of time it has grown by leaps and bounds as have other special medical studies. Freud has already written upon the psychoanalytic movement but the present work would, in a sense, continue this general story, both from the medical therapeutic earlier interests to the scientific theoretical principles which have spread over into vastly larger fields.

This spread has become so great that an inevitable confusion has become manifest. One is not now alluding to the many pseudo-analytical or wild analytical contributions, which seem to be the special camping ground of misinformed critics, but to the difficulties which sincere workers have met with the deeper the investigations have gone into unconscious processes in man and their resultant

symptomatology. The practical and therapeutic gains have seemed to outrun the more important theoretical foundations and a thorough investigation of the whole situation has seemed advisable. This is the main thesis of the present study.

In 1914 Freud contributed an important study upon "Remembering, Repeating and Working Through." From this point on new issues came into psychoanalytic technique and new theoretical considerations grew out of the material. Older technical rules needed revision, as with all scientific techniques, and new insight was gained, which this monograph very clearly sets forth.

The first situation discussed is that of the "unwinding of the libido." A situation which in a less consciously understandable form is that already seen in every medical situation, where the "doctor" quietly and patiently serves his patients. Here the "transference," which is an universal phenomenon, and necessary in all sincere medical practice, is more carefully analyzed in view of psychoanalytic principles, and the factors of resistance subjected to more painstaking scrutiny.

This leads to a critical historical retrospect of what has been gained and a revision of many of the older points of view especially with reference to the significance of free associations and interpretation of dream material. This is a very illuminating chapter and should be read by the superficial critics who have thought to make much material out of what they call "faulty methods" of psychoanalysis.

It was a common observation among many physicians using psychoanalytic methods that the ease of early cures gradually ceased and many disappointments arose. It almost seemed that the "laiety" becoming acquainted with the general principles, cured their own minor psychoneurotic difficulties, and only brought more difficult situations to the psychoanalyst, or that "cures" were not so often "cures" as substituted activities requiring more intensive application.

These and other problems are all reviewed in this very valuable monograph which marks a definite milestone in the advancing complexities of the new science of psychoanalysis.

Lange, Carl Georg, and James, William. The Emotions. [Williams and Wilkins Company, Baltimore.]

It was a happy idea this—to reprint under the caption of "Psychological Classics"—a translation of Lange's The Emotions, and James' essays What Is an Emotion? and The Emotion, the combination having been current for years under the idea—the James-Lange Theory of the Emotions.

Dr. Dunlap of Johns Hopkins sponsors the effort and we look forward to other fundamental conceptions which have been current in psychological circles. Whereas the work of James has been available in English for many years the work of his Danish precursor has heretofore been available only in French and in German. It is a valuable addition to all students of the mental sciences and what

educated man can think of himself as such without some comprehension of the mental life of man? We congratulate Dr. Dunlap upon his performance and hope to see other classics appear under his guidance. This is an indispensable work for the library of every worker in neuropsychiatry.

White, William A. The Meaning of Disease. [The Williams & Wilkins Company, Baltimore.]

Dr. White has termed this work in his subtitle, An Inquiry in the Field of Medical Philosophy. This is a comparatively unexplored field, i.e., by those competent to investigate. In practical literature there is no dearth of pseudophilosophies about medicine. To quote even a moiety would overrun our pages. Pliny vented his spleen upon doctors; Molière in his "Malades Imaginéres" held up the medicine of his day to ridicule; with much humor not unmixed with malignancy Bernard Shaw took a shot at modern conceptions of immunology, and coupled with his more recent swat at the clericals Sinclair Lewis in his "Arrowsmith" screeches a modern preachment at certain trends in medicine.

The present work, however, is no Arrowsmithian portrayal of the mendacity of practical medicine. Had Lewis but a scintilla of the knowledge of the field as Dr. White portrays it he could never have shown his myopic perspective.

Here is a real and honest effort to show how broad and wide must one's conceptions be to even understand what medicine and disease signify. Cheap and filthy criticism are easy—understanding is difficult, as Hippocrates had long ago spoken in his memorable statement *"Ars longa, vita brevis est"*—the whole quotation, running as a legend along the facade of the new and beautiful New York Academy of Medicine at 103d Street and Fifth Avenue, serving as a reminder to a posterity of the dignity and sincerity of the medical discipline.

Dr. White has caught the spirit of this Hippocratic conception and offered a work upon the significance of disease, which is both timely and salutary. He has here set forth in language that any one can understand what disease, in its larger frame is, at the same time most lucidly setting forth its complexities and intricacies.

One might wish that more efforts of this type might be offered to the new gigantic developments that are taking place in American medical activities. Had we more thinkers as sincere and as clear in setting forth the general principles that underly a philosophic understanding of the meaning of disease one could prophesy great things for American medicine.

Storfer, A. J. Almanach 1927. [Internationaler Psychoanalytischer Verlag. Wein.]

It was a happy idea that prompted the issuing of the Almanach of 1926 and so the issue for 1927 follows: Those in touch with the most intimate features of the psychoanalytic movement know what it is

all about. Here may be found some extremely interesting short articles upon psychoanalytic subjects. There is an excellent reproduction of Schmutzer's etching of Freud and a photograph of Abraham. Among the articles are reproduced the birthday addresses of Andreas-Salomé, Bleuler, Zwerg and Döblin on the occasion of Freud's 70th anniversary. Then follow three short papers by Freud, one on Psychoanalysis and Quackery being most readable; it is taken from his latest work on "Lay Analysis."

Then follow short studies by Pfister, Eder, Reik, Abraham, Levine, Wyneken, Binswanger, Kelsen, Kohn, Gomperz, Rank, v. Sydon, Jekels, Alexander, Horney, Simmel and Groddeck.

Some of these have appeared in other periodicals; others are new. The collection is noteworthy and the Almanach should be in the hands of all interested in the practical or theoretical aspects of psychoanalysis.

Seelert, Hans. Anleitung zu Psychiatrischen Untersuchungen. [George Thieme. Verlag. Leipzig.]

A short, concise and clear little handbook of methods of psychiatric examination. Psychiatry is here conceived of in the orthodox behavioristic and descriptive sense. No mention is made of the inner significance of any of the "facts" to be observed, without which no psychiatry is vital. As one who once having looked at the minute structure of things with a microscope is not content to rest with macroscopic observation, so once having really tasted on the methods for the study of the unconscious, the older regimes seem insipid.

Monrad-Krohn, G. H. The Clinical Examination of the Nervous System. [Third Edition. Paul B. Hoeber, Inc., New York.]

We have had occasion to commend this little volume highly on the appearance of both previous editions. It is not complete but it is clear and serviceable. The new edition has had added to it some notes upon the pharmacological testing of certain functions of the vegetative nervous system and also some descriptions of Thomas' work upon the pilomotor reflexes and Magnus-Kleijns postural reflex activities. It is even better than the previous editions.

Léri, Andre. Etudes sur les Affections de la Colonne Vertébrale. [Masson et Cie., Paris.]

Professor Léri, Agregé to the Faculty of Medicine in Paris, has for many years devoted much of his attention to neurology. At the same time, as is consistent with the best French traditions, he has made extensive and valuable surveys in other domains, one notably in studies on the bones and articulations other than those of the spinal column.

It is then quite consistent that the neurological interest should come nearer to the footlights in this study of diseases of the vertebral column, for here naturally the spinal cord and the various nerve plexuses become subjects of intimate interest.

Professor Pierre Marie has written a preface in his usual graceful style and called attention to certain features of the work. These are the studies on Spina Bifida, upon Sacralization of the Lumbar Vertebrae, upon Fracture of the Spinal Column, and a number of other vertebral diseases which, implicating the nervous system, constitute extremely important chapters in that frame, that Professor Marie, calling attention to Bouchard's vision, would designate the "chronic disorders of mankind," and the which he emphasizes should by all means be represented by a "Chair" in the Faculty of Medicine of every university.

When one realizes with what patience and indomitable energy one has to combat this vast horde of "incurables," the prey of every type of despicable parasitic exploiter in the realm of quackery, one can but echo an earnest "Amen" to Professor Marie's plea.

This work is therefore doubly welcome. It is not only sincere, but beautifully documented. The use of X-ray investigation is quite brilliantly set forth. Every neurologist meets with numerous instances of most annoying chronic illnesses in which disease of the spinal column plays a major rôle. Here is a most illuminating help to an understanding of these difficult problems.

Delgado, Honorio. SIGMUND FREUD. [C. F. Southwell, Lima, Peru.]

It is not many years ago when the opponents of psychoanalysis used to muster up a list of the old guard professors of neuropsychiatry who were antagonistic to the newer principles as evidence of its untrustworthiness or what not. But in the past ten years there has arisen a volume of adherents in nearly all the faculties of the entire world keenly alive to Freud's genius and to the fruitfulness of his conceptions in psychopathology. The old guard opponents now stand out as "islands" like the deserted castles of the Danube in comparison with the living younger members of the neuropsychiatric fraternity.

Here is found an appreciation from Lima, Peru, in the volume under consideration, which was prepared in honor of Freud's 70th birthday and given before the National Academy of Medicine in Lima, Peru.

It is a delightful review of the psychoanalytic movement in all its phases and is an excellent orientation as to the attitude of the growing body of the newer generations in South America.

Rivers, W. H. R. PSYCHOLOGY AND ETHNOLOGY. Edited with Preface and Introduction by G. ELLIOT SMITH. [Harcourt, Brace & Company, New York.]

Genetic psychology has become dominant, for the most part at least, in cultural circles. That the past has had much to do with the present no one doubts, and the acceptance of a general principle of recapitulation is fairly on its way, so long as one is not too meticulous in the straining of analogies.

In matters of antomical structure of the nervous system the conception is fully adhered to; in social structure it is highly probable, although as yet a complete genetic sociological platform has hardly more than begun to be erected.

Dr. Rivers has done much to follow such a viewpoint, and it is one of the great catastrophies of science, that he should have not been able to complete his work. Dr. Elliot Smith has done admirably with the unfinished fragments but one regrets that the author himself could not have revised the individual papers he left behind him.

For the student of neuropsychiatry there are many excellent chapters. It need not be insisted upon in these columns how much ethnology belongs to the deeper understanding of man's mnemic inheritance of racial experience. We are inclined to be sententious and point out that one doubting this general conception would be best described as one with long ears and whose family crest is a bale of hay.

At all events we feel convinced that the reading of the book notwithstanding some juvenilities, would reduce the length of the ears or the size of the fodder of any aforementioned doubting Thomas.

Rouhier, A. Le Peyotl. [Gaston Doin et Cie., Paris.]

A very complete and satisfactory monograph upon the "Mescal" plant, now termed by the botanical systematists *Echinocactus Williamsii,* mostly known in American literature as *Anhalonium Lewinii.*

The author gives us a complete botanical, pharmacognostic, chemical, pharmacological study; one of the most satisfactory with which we are acquainted. We note in passing he has overlooked Maloney's careful psychological investigation, one of the best in the literature.

Thévenard, André. Les Dystonies d'Attitude. [Gaston Doin, Paris.]

This small but very delightful monograph is a direct outgrowth of the encephalitis epidemic and of the work upon the extrapyramidal systems, specially founded however, as he states in his introduction, upon some dystonia patients of the Ziehen-Oppenheim type.

The monograph begins with a discussion of so-called normal vertical standing, its bony and muscular correlates.

Elementary motor synergisms are then taken up, and the leg and foot phenomena involved in maintaining equilibrium minutely analyzed. The tonus of position then is discussed, to be followed by pathological states, thus involving consideration of the Magnus studies on labyrinthine and neck reflex phenomena.

This leads directly into pathological states, the first of which taken up is dystonia musculorum, then decerebrate rigidity, athetosis, torticollis, and a final chapter upon the anatomopathology of these various anomalies of posture.

A delightful, clear and practical monograph.

Notes and News

BRITISH-AMERICAN NEUROLOGICAL MEETING

A combined meeting of the Neurological Section of the Royal Society of Medicine and the American Neurological Association will be held in London, at the House of the Royal Society of Medicine, 1 Wimpole Street, W.1, on July 26, 27 and 28, 1927.

Tentative Program

Tuesday, July 26th:

9.30 a.m.: Short papers.
2 p.m.: Short papers.

Wednesday, July 27th:

9.30 a.m.: *Discussion on the Cerebellum:*

(1) Drs. Frederick Tilney and H. A. Riley: "Comparative Morphology."
(2) Drs. L. J. Pollock and L. Davis: "Physiology."
(3) Dr. Aubrey T. Mussen: "Experimental Results."
(4) Dr. Harvey Cushing: "Surgery."
(5) Dr. T. H. Weisenburg: "Clinical."

To be discussed by Dr. James Collier, Dr. Gordon Holmes, Dr. F. M. R. Walshe and Mr. Wilfred Trotter.

2.30 p.m.: Special clinical meeting.

Thursday, July 28th:

9.30 a.m.: *Discussion on Sensory Disorders in Organic Disease of the Nervous System:*

(1) Professor J. S. B. Stopford: "Sensory Disturbances Following Division and Suture of a Peripheral Nerve."
(2) Dr. Gordon Holmes: "Sensory Disturbances Due to Spinal and Brain-Stem Lesions."
(3) Dr. Wilfred Harris: The same.
(4) Dr. S. A. Kinnier-Wilson: "Certain Dysaesthesiae and Their Neural Correlates."

2 p.m.: Papers and Demonstrations on Pathological Subjects.

5 p.m.: Dr. Charles L. Dana will deliver the Hughlings-Jackson Lecture.

BRITISH MEDICAL ASSOCIATION

The annual meeting will be held in Edinburgh, Scotland, on July 19 to 22, 1927, inclusive. It will be the occasion of the centenary celebration of the birth of Lister. Dr. Edwin Bramwell, 23 Drumsheugh Gardens, Edinburgh, is the Chairman of the Neurological Section. A very cordial invitation has been extended to American neurologists to attend.

Two numbers of a new *Archives of Psychoanalysis* have been received which are worthy of attention. Dr. L. Pierce Clark is the directing editor. They contain important psychoanalytic material which by reason of its bulk or minutiæ is usually excluded from the usual technical journals. The first number also contains the beginning of the translation of Groddeck's Das Buch Vom Es, an extremely delightful work and one that all neuropsychiaters should know, and Number 2 contains a translation of Freud's Hemmung, Symptom and Angst, which is one of the latest and most comprehensive expressions of Freud's views concerning the relationships of these behavioristic responses. The *Archives of Psychoanalysis* will appear quarterly. No. 2 is bound—250 pages each—and the cost will be $5.00 per number.

NOTICE

A meeting of the I'Ligue Internationale Contre I'Epilepsie (The International League Against Epilepsy) will be held in Zurich, Switzerland, early in August. The exact dates will be published soon. Those who wish to bring before the meeting any communications or read papers, are invited to communicate with Dr. L. J. Muskens, Secretary, 136 Volden Straase, Amsterdam, Holland; Dr. Ulrich, Canton Interspital, Zurich, Switzerland; Dr. G. Kirby Collier, 80 East Avenue, Rochester, New York, or Dr. A. L. Shaw, The Olbiston, Utica, New York.

N. B.—All business communications should be made to Journal of Nervous and Mental Disease, 64 West 56th St., New York.

All editorial communications should be made to Dr. Smith Ely Jelliffe, Managing Editor, 64 West 56th St., New York.

INDEX TO VOLUME 65

Figures with asterisk (*) indicate original articles and are accompanied with title. Figures unaccentuated, accompanied with title, indicate abstracts.

Vol. 65 JUNE, 1927 No. 6

The Journal
OF
Nervous and Mental Disease

AN AMERICAN JOURNAL OF NEUROPSYCHIATRY

FOUNDED IN 1874

Presenting Reports of the
AMERICAN NEUROLOGICAL ASSOCIATION, AMERICAN PSYCHIATRIC ASSOCIATION, NEW YORK NEUROLOGICAL SOCIETY, NEW YORK PSYCHIATRICAL SOCIETY, BOSTON SOCIETY OF PSYCHIATRY AND NEUROLOGY, ETC.

SERIAL NO. 546

2 VOLS. PER YEAR

ISSUED MONTHLY $1.00 PER COPY $10.00 PER YEAR

FOREIGN SUBSCRIPTION $11.00 PER YEAR

Entered as second-class matter at the Post Office at Albany, New York. March 30, 1922.

N. B.: See Index of Journal of Nervous and Mental Disease: Vols. 1-50
Just prepared: See page IX

TABLE OF CONTENTS

MILWAUKEE SANITARIUM

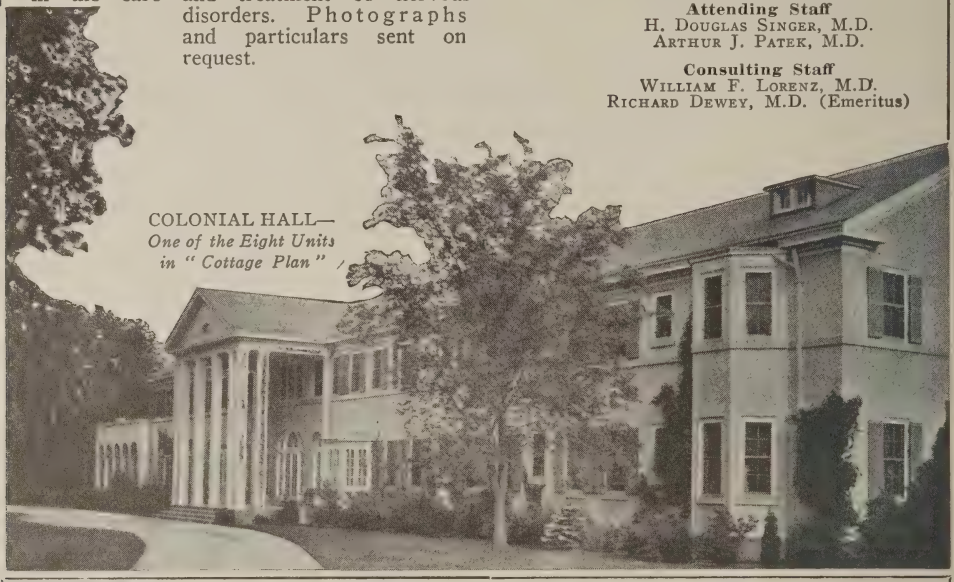
Wauwatosa, Wisconsin. (Chicago Office—1823 Marshall Field Annex —Wednesdays, 1-3 P.M.)

Maintaining the highest standards over a period of forty-two years, the Milwaukee Sanitarium stands for all that is best in the care and treatment of nervous disorders. Photographs and particulars sent on request.

Resident Staff
ROCK SLEYSTER, M.D., Med. Dir.
WILLIAM T. KRADWELL, M.D.
MERLE Q. HOWARD, M.D.

Attending Staff
H. DOUGLAS SINGER, M.D.
ARTHUR J. PATEK, M.D.

Consulting Staff
WILLIAM F. LORENZ, M.D.
RICHARD DEWEY, M.D. (Emeritus)



COLONIAL HALL—
One of the Eight Units in "Cottage Plan"

THE BEACON SCHOOL

FOR PROBLEM CHILDREN

Situated in Summit, N. J., six hundred feet above sea level, THE BEACON SCHOOL combines for PROBLEM children who are not able to keep the pace of the robust types, a real "Home" and a "School."

School instruction according to mental development. Supervised play hours.

Tuition $1,200 a year.

Summer camp Bridgton, Maine.

Mrs. Elsa Y. Palmer, 45 Oakridge Ave., Summit, N. J.

CHANNING SANITARIUM, INC.

(Established in Brookline, 1879)
Has been transferred to Wellesley Avenue
WELLESLEY, MASS.

Seven new buildings on fifty acres of high woodland. Sleeping porch and private bath for each patient. Large and small suite cottages. Separate buildings for men and women. Facilities for occupation and diversion. Complete equipment for Vichy, Nauheim and Electric Baths and other forms of Hydrotherapy.

Clifford G. Rounsefell, M.D. Resident Physician **Donald Gregg, M.D. Superintendent**

Belle Mead Farm Colony and Sanatorium

Belle Mead, New Jersey

For insane, senile and nervous patients, alcoholic and drug addicts; also selected cases of feeble minded and epilepsy. Country, 42 miles from New York City and Philadelphia. Reasonable rates for excellent accommodations and scientific treatment.

Five Attractive Buildings

Under State License

For rates and detailed information, address the Resident Physician, or New York City office, 666 Madison Ave. Hours 3-4 daily.

BOOKS RECEIVED FOR REVIEW

FURTHER CONTRIBUTIONS TO THE THEORY AND TECHNIQUE OF PSYCHOANALYSIS: *S. Ferenczi,* Hogarth Press, London

CLINICAL NEUROLOGY: *E. A. Strecker, M. K. Meyers,* P. Blakiston's Son & Co., Philadelphia

THE TIRED CHILD: *M. Seham, G. Seham,* J. B. Lippincott Co., Philadelphia

LA PSYCHOLOGIE ORGANIQUE: *P. Jean,* Felix Alcan, Paris

VINCENT VAN GOGH IN DER KRANKHEIT: *W. Riese,* J. F. Bergmann, Munchen

DIE METHODIK DER ERFORSCHUNG DER BEDINGTEN REFLEXE: *N. A. Podkopaew,* J. F. Bergmann, Munchen

UBER APHASIE: *K. Goldstein,* Orell Fussli Verlag, Zurich

DAS PROBLEM DER ERMUDUNG: *J. Alfven,* Ferdinand Enke, Stuttgart

MINERAL WATERS OF THE UNITED STATES AND AMERICAN SPAS: *W. E. Fitch,* Lea & Febiger, Philadelphia

DIE PSYCHOKATHARTISCHE BEHANDLUNG NERVOSER STORUNGEN: *L. Frank,* Georg Thieme, Leipzig

SEMIOLOGIE DES AFFECTIONS DU SYSTEME NERVEUX: *J. Dejerine,* Masson & Cie., Paris

LES NOUVELLES METHODES SUR LES REACTIONS COLLOIDALES DU LIQUIDE CEPHALO-RACHIDIEN: *E. de Thurzo,* N. Maloine, Paris

THERAPIE DER OGRANISCHEN NERVENKRANKHEITEN: *M. Schacherl,* J. Springer, Wien

INNERE SEKRETION IN DER ERSTEN LEBENSZEIT: *E. Thomas,* G. Fischer, Jena

TASCHENBUCH DER PRAKTISCHEN UNTERSUCHUNGSMETHODEN DER KORPERFLUSSIGKEITEN BEI NERVEN UND GEISTESKRANKHEITEN: *V. Kafka,* J. Springer, Berlin

THE MYSTIC ROSE: *E. Crawley,* Boni & Liveright, New York City

WHY RELIGION? *H. Kallen,* Boni & Liveright, New York City

PSYCHOPATHOLOGY: *B. Hart,* Macmillan Co., New York City

VAD BETYDA ISONDRINGSORGANEN FOR VAR KROPP OCH SJAL? *A. Josefson,* H. Gebers, Stockholm

PSYCHOANALYSE: *R. Urbantschitsch,* M. Perles, Wien

PLOTZLICHE UND AKUTE ERKRANKUNGEN DES NERVENSYSTEMS: *S. Fleischmann,* S. Karger, Berlin

DER SENSITIVE BEZIEHUNGSWAHN: *E. Kretschmer,* J. Springer, Berlin

YOUR NERVOUS CHILD: *E. Wexberg,* A. & C. Boni, New York City

NEUERE BEOBACHTUNGEN UBER DIE PSYCHOLOGIE DER ZU LEBENSLANGLICHER ZUCHTHAUSSTRAFE VERURTEILTEN ODER BEGNADIGTEN VERBRECHER: *H. Tobben,* F. Deuticke, Leipzig

KENILWORTH, ILLINOIS

(Established 1905)

(C. & N. W. Railway, 6 miles north of Chicago)

Built and equipped for the treatment of nervous and mental diseases. Approved diagnostic and therapeutic methods. An adequate night nursing service maintained. Sound-proofed rooms with forced ventilation. Elegant appointments. Bath rooms en suite, steam heating, electric lighting, electric elevator.

Resident Medical Staff:

Sherman Brown, M.D. Mable Hoiland, M.D. Sanger Brown, M.D.

Consultation by appointment only

All correspondence should be addressed to KENILWORTH SANITARIUM, Kenilworth, Ill.

SEGUIN SCHOOL 1880 1927

for Children who Deviate Mentally from the Normal

Limited to 25 educable pupils—little girls and boys and young women (no epileptics—no insane); eleven experienced teachers; five governesses supervise play hours

Large grounds adjoining 50 acre park

Tuition and Board from Sept. 15 to June 15, $1800
Summer School in Mountains, June 15 to Sept. 15, $450

MRS. ELSIE M. SEGUIN, Director 500 South Centre St., Orange, N. J.

WESTWOOD LODGE

A modern, private sanatorium within fifteen miles of Boston, fully equipped for the scientific treatment of nervous and mild mental diseases, also for those in need of rest under medical supervision. The building stands in the midst of over one hundred acres comprising woodlands, cultivated gardens, beautiful pine groves and walks.

For further information, apply to
WILLIAM J. HAMMOND, M.D.
Resident Physician
Westwood Mass.

BOURNEWOOD

A Private Hospital for Mental Diseases

Number of patients limited to eighteen. Cases of alcohol or drug habituation not received. Telephone "Parkway 300." Nearest station, Bellevue on the N. Y., N. H. & H. R. R. Boston office, 48 Beacon Street. By appointment.

GEORGE H. TORNEY, M.D.

THE VAN VALEN SANATORIUM

Yonkers, N. Y.

Psycho-Therapeutic treatment for mental, nervous, functional disorders and addictions. Also receive patients needing care, with or without treatment.

Booklet Upon Request. Phone Yonkers 5321

THE NORBURY SANATORIUM

JACKSONVILLE ILLINOIS

Incorporated and Licensed.

For the treatment of Nervous and Mental Disorders.

Dr. Frank P. Norbury, Medical Director.
Dr. Albert H. Dollear, Superintendent.
Dr. Frank Garm Norbury,
Dr. Samuel N. Clark, } Associate Physicians.

Address Communications
THE NORBURY SANATORIUM, Jacksonville, Illinois.

GLENMARY SANITARIUM

Owego, Tioga Co.
New York

For the care and treatment of a limited number of selected cases of Nervous and Mental Disease. Voluntary cases admitted. Epileptics treated and cared for. Absolute privacy and special ethical treatment for Alcohol and Drug Addictions. Close cooperation at all times with the family physician.

ARTHUR J. CAPRON. M.D., Physician-in-Charge.

Oconomowoc Health Resort

OCONOMOWOC, WIS.

Absolutely Fireproof

Built and Equipped in 1907 for treating
NERVOUS AND MILD MENTAL DISEASES

Three Hours from Chicago on C. M. & S. P. Ry.

Location Unsurpassed—Readily Accessible

ARTHUR W. ROGERS, B.L., M.D.
Resident Physician in Charge
JAMES C. HASSALL, M.D., Med. Supt.
FRED. C. GESSNER, M.D., Asst. Physician

DIRECTORY FOR PRIVATE INSTITUTIONS

(Continued on page XVII)

MORPHINE DRUG ADDICTIONS AND ALCOHOLISM

Treated by the *"Quayle Method."* A safe and easy way. Results guaranteed. Treatment is painless and supportive, rather than depressant. No nervous period experienced. I also furnish a *Home Treatment* for Physicians to use in treating addicts at home, who for various reasons are unable to go to a Sanitarium.

For full particulars address

DR. QUAYLE SANITARIUM

CHAS. H. QUAYLE, M.D., Medical Director

Dept. B MADISON, OHIO

RIVER CREST ASTORIA, L. I. N. Y. CITY

Home-like, well-equipped sanitarium for nervous and mild mental patients. Drug and alcoholic habitués are also received. Twenty-five years under same management. The physicians have unusually large experience. The site is exceptional. Nearest psychiatric institute to centre of Manhattan. Rates reasonable. Reached by all subways via Grand Central Station, Astoria car, Queensboro Tube. Located at Ditmars Avenue and Kindred Street. Phone 0820. City office 666 Madison Ave. Cor. 61st St. 3-4 daily. Phone Regent 7140.

For Terms and Booklet address **WM. ELLIOTT DOLD, Physician in Charge**

DR. MOODY'S SANITARIUM

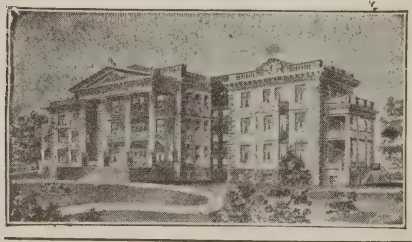
SAN ANTONIO, TEXAS

For Nervous and Mental Diseases, Drug and Alcohol Addictions, and Nervous Invalids Needing Rest and Recuperation.

Established 1903. Strictly ethical. Location delightful, summer and winter. Approved diagnostic and therapeutic methods. Modern clinical laboratory. 7 buildings, each with separate lawns, each featuring a small separate sanitarium, affording wholesome restfulness and recreation, indoors and outdoors, tactful nursing and homelike comforts. Bathrooms ensuite, 100 rooms, large galleries, modern equipment. 15 acres, 350 shade trees, cement walks, playgrounds. Surrounded by beautiful parks, Government Post grounds and Country Club.

G. H. MOODY, M.D., Supt.
T. L. MOODY, M.D., Res. Phys.

J. A. McINTOSH, M.D., Res. Phys.



WAUKESHA SPRINGS SANITARIUM
WAUKESHA, WISCONSIN

For the Care and Treatment of
NERVOUS AND MENTAL DISEASE

Building absolutely fireproof

BYRON M. CAPLES, M.D., Medical Director
FLOYD W. APLIN, M.D. and
L. H. PRINCE, M.D.

GREEN GABLES

The Dr. Benj. F. Bailey Sanatorium

Lincoln, Nebraska

A scientifically equipped, homelike institution, housed in brick and stone buildings. located in its own park of twenty-five acres

Idylease Inn, Newfoundland, N. J. 20
Interpines, Goshen, N. Y. 18

Kellogg, Dr. T. H., Riverdale, N. Y. 20
Kenilworth Sanitarium, Kenilworth, Ill. 18
Kidd, Dr. R. A., Columbus, O. 18

Livermore Sanitarium, Livermore, California 11
Lloyd, Dr. Henry W., Riverdale, N. Y. 19

Magnus, Dr. A. B., Chicago, Ill. 21
McFarland, Dr. D. W., Green's Farms, Conn. 20
McIntosh, Dr. J. A., San Antonio, Tex. 16
McMillen Sanitarium, Columbus, O. 18
Milwaukee Sanitarium, Wauwatosa, Wis. 6
Moody, G. H., Dr. Moody's Sanitarium, San Antonio, Tex. 16
Moody, T. L., San Antonio, Tex. 16

Neuron Hurst, Dr. W. B. Fletcher's Sanatorium, Indianapolis, Ind. 20
Norbury Sanitarium, Dr. F. P. Norbury, Jacksonville, Ill. 14

Oconomowoc Health Resort, Oconomowoc, Wis. 14
Orchards, Stamford, Conn. 20
Oxford Retreat, Oxford, Ohio 15

Palmer, Mrs. Elsa Y., Summit, N. J. 6
Podstata, Dr. V. H., Livermore, California 11
Potter, Dr. C. A., Goshen, N. Y. 18
Priddy, Dr. Hugh W., Memphis Tenn. 12
Prout, Dr. T. P., Summit, N. J. 12
The Psychoanalytic Institute, Stamford, Conn. 20

Quayle, Dr. Chas. H., Dr. Quayle Sanitarium, Madison, Ohio 16

River Crest, Astoria, L. I., New York City 16
Robinson, Dr. G. W., Kansas City, Mo. 11
Rogers, Dr. A. W., Oconomowoc, Wis. 14
Rounsefell, Dr. Clifford G., Wellesley, Mass. 6
Ruland, Dr. F. D., Westport, Conn. 18

Scott, Dr. E. A., Goshen, N. Y. 18
Seguin School, Orange, N. J. 18
Seward, F. W., Goshen, N. Y. 18
Sleyster, Dr. Rock, Wauwatosa, Wis. 6
Spink, Dr. Mary A., Indianapolis, Ind. 20
Spruces, Staatsburg-on-Hudson, N. Y. 19
Thompson, Dr. W. N., Hartford, Conn. 12

(*Continued on page XXI*)

Exchange or Want Column

This column is for those who desire to give, sell, buy or exchange journals, books or preparations connected with neuropsychiatry. *Send all communications to Journal office.*

Wanted: Bound or unbound copies of Vols. 1, 2, 3, 4; Vol. 47, Nos. 1 and 3; Vol. 57, No. 1. For following will pay $1.50 per copy, 1876, complete; 1885, Nos. 1, 2, 4; 1886, Nos. 3, 11, 12; 1887, Nos. 9, 10; 1889, Nos. 1, 2, 3, 4, 5, 6; 1890, No. 5; 1892, Nos. 11, 12. Journal of Nervous and Mental Disease.

Wanted: Bound or unbound copies of January, 1917; January, 1918; October, 1918; April, 1919; January, 1919; October, 1919; January, 1920; January, 1921; April, 1921, Psychoanalytic Review.

Wanted: Bound or unbound copies of Alienist and Neurologist, Journal of Abnormal Psychology, Vol. XI.

Wanted: Bound or unbound copies of "Imago" and "Zentralblatt für Psychoanalyse," Imago, Vol. VI, No. 1.

Wanted: Bourneville et Geurard: Le Sclerose en plaques, 1869.

Wanted: Photographs of Valentiner; Ordenstein; J. Parkinson.

JOURNAL OF NERVOUS AND MENTAL DISEASE

64 West 56th St., New York

The Psychoanalytic Review

A Journal Devoted to an Understanding of Human Conduct

Edited and Published by

WILLIAM A. WHITE, M.D., and SMITH ELY JELLIFFE, M.D.

CONTENTS, APRIL, 1927

Issued Quarterly: $6.00 per Volume; Single Numbers, $1.75; Foreign, $6.60