

BUILDING
HUMAN
INTELLIGENCE
BY
ARNOLD LORAND, M.D.

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BUILDING HUMAN INTELLIGENCE

"Only that may enter our mind which has
made its way through the senses."

ST. THOMAS AQUINAS

BY

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TRANSLATED FROM THE GERMAN

BY

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PREFACE.

IT may seem rather daring at first blush to write a book on such a topic. If, however, human intelligence, as nobody can deny, depends on the normal function of the brain, there can be no reason why the latter could not just as well be influenced by a number of hygienic and therapeutic means, as, for instance, the functions of the heart or of the kidney. In continuation of my books on a hygienic mode of living and correct feeding, I now have made an attempt to suggest a number of means for the health of the mind based upon a hygienic-physiologic foundation, as even very distinguished scholars sin against the simplest requirements of hygiene and carry on such a destructive wasting of their mental faculties that they become used up prematurely. Being engaged with many complex questions, these gentlemen sin against a sensible mode of living, and the consequence is a premature breakdown. It is, therefore, no wonder that so many great scholars and naturalists manifest signs of arteriosclerosis of the blood-vessels of the brain too soon, and become mentally diseased. Still worse is it that, through an entirely wrong and unhygienic way of education and instruction, which violate the laws of the most elementary hygiene and reason, a destruction of the mental faculties of children is carried on under the protection and sanction of the State authorities. Everything is taught in our school but plain human common sense! By overtaxing the delicate organism of the children with dry, scholastic knowledge, without taking into consideration practical demonstration and the exercising of the senses, the foundation is often laid for serious nervous diseases; and, in cases where there is an hereditary disposition, even to mental diseases. Such diseases may develop slowly without being recognized, and medical

aid is principally sought when it is too late: insanity has broken out or violent deeds, murder, etc., have been committed. Indeed, there is no other branch of medicine in which the condition of prophylaxis is in such a deficient state. The first signs of insanity are generally ignored or mistaken, and, therefore, it is no wonder that the therapeutics of mental diseases, particularly of the sequel disease of syphilis—progressive paralysis—is so little advanced, since help is sought only when irreparable injuries have already taken place. And still this disease, as well as many other serious mental and nervous diseases, in all probability, could be prevented and perhaps healed by rational care of the nervous system, and by maintaining physical and mental health; and by *attending to it very early* many a case of neurasthenia could be improved, and some, perhaps, cured.

While it is true that physical health is the best guarantee for a healthy mental condition, which is also expressed in the saying of the Romans, “*Mens sana in corpore sano*,”¹ it is, nevertheless, shown that a surprisingly large number of great men, particularly of the great thinkers and scholars such as Kant, Helmholtz, Newton, Watt, and others, have been sickly children, and often remained weak their whole lives long; yet this in no way affected either their mental faculties or their longevity. To illustrate some of my statements I found it necessary to delve somewhat more into the modes of life and habits of some of the great men. The necessary data were found in a number of treatises by contemporaries of these mental heroes, as well as in the writings of Moebius and W. Oswald. I have also used a number of encyclopedias, which were placed at my disposal in the British Museum, in London, and in the Royal Libraries, at the Hague, in Holland, particularly the very correct and thorough biographies found in the *Encyclopedia Britannica* and *Hispano Americana*.

The treatment of such a new subject as this, in regard to which nothing exists in the whole of literature, presents indeed

¹ A healthy mind in a healthy body.

many difficulties. This is particularly the case concerning a subject which lies somewhat out of the usual sphere of activity of a physician in my position, and, therefore, a severe critic may have ample opportunity to ruffle my feathers. If he will admit, however, in his just criticism, that there is at least a single good thought in this work which may further the common welfare, I shall consider the goal for which I have been striving in the preparation of this work as having been attained.

LORAND.

CONTENTS.

I. THE INFLUENCE OF VARIOUS FACTORS UPON THE FACULTY OF THINKING.

	PAGE
CHAPTER I.	
BLOOD CIRCULATORY CONDITIONS IN THE BRAIN, AND THEIR INFLUENCE UPON THE FACULTY OF THINKING.....	1
CHAPTER II.	
THE INFLUENCE OF THE GLANDS OF INTERNAL SECRETION UPON THE FACULTY OF THINKING AND THE ORIGIN OF MENTAL DISORDERS.....	16
CHAPTER III.	
THE INFLUENCE OF THE NASAL CHAMBERS UPON THE CIRCULATORY CON- DITIONS IN THE BRAIN AND THE ABILITY OF THINKING.....	39
CHAPTER IV.	
THE INFLUENCE OF METABOLISM UPON THE FACULTY OF THINKING.....	48
CHAPTER V.	
THE INFLUENCE OF LIME AND PHOSPHORUS METABOLISM UPON THE FACULTY OF THINKING AND THE ORIGIN OF MENTAL DISEASES.....	52
CHAPTER VI.	
THE INFLUENCE OF NOURISHMENT UPON THE INTELLIGENCE.....	57
CHAPTER VII.	
INFLUENCE OF CLIMATE, SEASONS OF THE YEAR AND WEATHER UPON THE ABILITY TO THINK AND MENTAL ACTIVITY.....	62
CHAPTER VIII.	
INFLUENCE OF HEREDITY UPON THE ABILITY OF THINKING.....	67
CHAPTER IX.	
THE INFLUENCE OF AGE UPON THE INTELLIGENCE.....	74

II. THE INFLUENCE OF SEXUAL IMPULSE
AND THE SEXUAL DIFFERENCE UPON
THE INTELLIGENCE.

CHAPTER X.

	PAGE
THE INFLUENCE OF SEXUAL IMPULSE, THE EXCESS OF IT AND ITS ABSENCE, UPON THE INTELLIGENCE.....	84

CHAPTER XI.

THE INFLUENCE OF SUPPRESSED SEXUAL IMPULSE AND ONANISM.....	92
---	----

CHAPTER XII.

THE INFLUENCE OF SEXUAL DIFFERENCE ON THE FACULTY OF THINKING —THE INTELLIGENCE OF A MAN AND THAT OF A WOMAN.....	97
--	----

III. HARMFUL INFLUENCES UPON THE THINK-
ING ABILITY AND THEIR TREATMENT AC-
CORDING TO THE NEWER PRINCIPLES.

CHAPTER XIII.

CAUSES OF INSANITY AND THEIR PREVENTION.....	105
--	-----

CHAPTER XIV.

THE INFLUENCE OF ALCOHOL UPON THE MENTAL FACULTIES.....	115
---	-----

CHAPTER XV.

INFLUENCE OF SLEEPINESS AND SLEEPLESSNESS AND ITS RATIONAL TREAT- MENT	125
---	-----

CHAPTER XVI.

THE INFLUENCE OF MIGRAINE AND HEADACHES IN GENERAL UPON THE FACULTY OF THINKING AND THEIR RATIONAL TREATMENT.....	132
--	-----

CHAPTER XVII.

CONSEQUENCES OF MENTAL OVERSTRAIN AND FATIGUE, THEIR PREVENTION AND TREATMENT	140
--	-----

CHAPTER XVIII.

INFLUENCE OF THE NERVOUS SEQUEL DISEASES OF SYPHILIS—PROGRESSIVE PARALYSIS, ITS PREVENTION AND TREATMENT.....	146
--	-----

CHAPTER XIX.

	PAGE
THE NATURE AND ORIGIN OF PARALYTIC DEMENTIA.....	156

CHAPTER XX.

THE INFLUENCE OF NERVOUSNESS, NEURASTHENIA AND HYSTERIA, AND THE TREATMENT OF THIS CONDITION ACCORDING TO THE NEWER PRINCIPLES	161
--	-----

CHAPTER XXI.

THE INFLUENCE OF THE DISEASES OF THE THYROID GLAND.....	170
---	-----

CHAPTER XXII.

INFLUENCE OF EPILEPSY AND ITS TREATMENT ACCORDING TO MODERN PRINCIPLES	186
---	-----

IV. INCREASE OF THINKING ABILITY BY
HYGIENIC AND THERAPEUTIC MEANS.

CHAPTER XXIII.

PROMOTION OF MENTAL FACULTIES BY HYGIENIC MEANS.....	190
--	-----

CHAPTER XXIV.

HYGIENIC MEANS TO IMPROVE THE BLOOD-CIRCULATION IN THE BRAIN....	202
--	-----

CHAPTER XXV.

THE IMPORTANCE OF TAKING CARE OF THE NOSE AND ABOUT OCCASIONAL SNUFFING	208
--	-----

CHAPTER XXVI.

THE FAVORABLE INFLUENCE OF A SUNNY, HIGH ALTITUDE UPON THE INTELLIGENCE	212
--	-----

CHAPTER XXVII.

HINTS IN REGARD TO THE BEST POSSIBLE UTILIZATION OF SUNLIGHT, AND HOW TO CARRY OUT SUN-BATHS.....	221
--	-----

CHAPTER XXVIII.

FURTHERING OF MENTAL FACULTIES BY MEANS OF CERTAIN DRUGS.....	226
---	-----

CHAPTER XXIX.

IMPROVEMENT OF MENTAL FACULTIES BY THE USE OF EXTRACTS FROM ANIMAL ORGANS	233
--	-----

V. THE POWER OF THINKING, AND RATIONAL THINKING—THEIR DEVELOPMENT, PARTICULARLY IN PRACTISING THE SENSES.

CHAPTER XXX.	
THE SEAT OF THINKING POWER AND THE PROCESS OF THINKING.....	PAGE 242
CHAPTER XXXI.	
RATIONAL THINKING	256
CHAPTER XXXII.	
EXTERNAL AND INTERNAL SIGNS OF HIGH AND LOW INTELLIGENCE.....	265
CHAPTER XXXIII.	
THE IMPORTANCE OF EXERCISING THE SENSES.....	274
CHAPTER XXXIV.	
THE ADVANTAGE OF EXTENSIVE TRAVELLING AS PRACTICAL EXERCISES FOR THE SENSES	281
VI. MEMORY AND ITS SYSTEMATIC DEVELOPMENT.	
CHAPTER XXXV.	
THE FOUNDATION OF MEMORY AND ITS DEPENDENCE UPON THE CONDITIONS OF BLOOD-CIRCULATION IN THE BRAIN-CORTEX.....	286
CHAPTER XXXVI.	
CONDITIONS REQUIRED FOR A GOOD MEMORY.....	294
CHAPTER XXXVII.	
CAUSES OF WEAK MEMORY AND ITS TREATMENT.....	307
CHAPTER XXXVIII.	
SOME HINTS TO FACILITATE MEMORY.....	314
CHAPTER XXXIX.	
THE ART OF FORGETTING AND TREATMENT OF BAD HABITS.....	318

VII. RATIONAL MENTAL WORK.

CHAPTER XL.

	PAGE
RATIONAL LEARNING AND STUDYING.....	324

CHAPTER XLI.

THE INFLUENCE OF AGE UPON THE ABILITY TO LEARN—LEARNING AS DONE BY CHILDREN AND BY THE OLD.....	331
--	-----

CHAPTER XLII.

RATIONAL METHOD OF LECTURING AND INSTRUCTING.....	335
---	-----

CHAPTER XLIII.

A FEW WORDS ABOUT RATIONAL WRITING OF TEXTBOOKS AND SCIENTIFIC TREATISES	344
---	-----

CHAPTER XLIV.

THE RATIONAL STUDYING OF FOREIGN LANGUAGES.....	347
---	-----

CHAPTER XLV.

HINTS ABOUT COMPOSITION OF THE FOOD IN STRENUOUS MENTAL WORK..	356
--	-----

CHAPTER XLVI.

RATIONAL FOOD FOR MUSICIANS.....	361
----------------------------------	-----

VIII. RATIONAL DEVELOPMENT OF INTELLIGENCE IN CHILDREN.

CHAPTER XLVII.

HINTS ABOUT MENTAL EDUCATION OF CHILDREN—THE HARM OF PUN- ISHMENT	344
--	-----

CHAPTER XLVIII.

BAD AND DULL PUPILS—CAUSES OF DULLNESS AND ITS TREATMENT.....	374
---	-----

CHAPTER XLIX.

DILIGENCE, LAZINESS, AND ABSENT-MINDEDNESS—TREATMENT OF LAZI- NESS AND ABSENT-MINDEDNESS.....	381
--	-----

CHAPTER L.

HINTS IN REGARD TO THE RATIONAL FEEDING OF SCHOOL-CHILDREN.....	389
---	-----

	PAGE
CHAPTER LI.	
GREAT MEN WHO WERE SICKLY CHILDREN—LONGEVITY OF GREAT MEN..	393
CHAPTER LII.	
GREAT MEN WHO WERE EAGER READERS IN CHILDHOOD—THE ADVANTAGE OF MUCH READING, AND OF DILIGENT PRIVATE STUDYING.....	398
CHAPTER LIII.	
GREAT MEN WHO WERE BAD PUPILS.....	406
IX. HYGIENIC PRINCIPLES FOR A REFORM OF THE SCHOOL CURRICULUM, PARTICULARLY IN THE MIDDLE SCHOOLS (HIGH SCHOOLS).	
CHAPTER LIV.	
REFORM OF THE HIGH-SCHOOL CURRICULUM ON HYGIENIC, PHYSIOLOGICAL PRINCIPLES	412
CHAPTER LV.	
THE NECESSITY OF AN EXPERT EXAMINATION OF THE ORGANS OF SENSE AND THE INTELLIGENCE OF PUPILS BEFORE ENTERING THE GYMNASIUM (HIGH SCHOOL)	417
CHAPTER LVI.	
THE OBLIGATORY TRAINING IN ART NEEDLEWORK, AND MANUAL TRAINING	422
CHAPTER LVII.	
THE NECESSITY OF OUTDOOR SCHOOLS.....	427
CHAPTER LVIII.	
INJURY CAUSED BY EXAMINATIONS FROM THE HYGIENIC STANDPOINT, PARTICULARLY OF THE EXAMINATION FOR GRADUATION.....	429
CHAPTER LIX.	
THE NECESSITY OF EDUCATING INGENIOUS CHILDREN OF THE POOR AT THE STATE'S EXPENSE	434
CHAPTER LX.	
BIOGRAPHIES OF GREAT MEN AS AN OBLIGATORY SUBJECT OF INSTRUCTION IN OUR SCHOOLS.....	439
INDEX	445

I. THE INFLUENCE OF VARIOUS FACTORS UPON THE FACULTY OF THINKING.

CHAPTER I.

BLOOD CIRCULATORY CONDITIONS IN THE BRAIN, AND THEIR INFLUENCE UPON THE FACULTY OF THINKING.

IT is a peculiar fact that frequently in various kinds of mental diseases, as for instance in melancholia, a striking improvement of the condition, sometimes even a cure, may occur when the patient becomes affected with an attack of fever. A similar fact may frequently be observed after an artificially produced fever,—for instance, after a tuberculin injection.

We must, therefore, assume that the brain-cortex, the seat of thinking-faculty, may be influenced by fever. What characterizes fever is an elevation of the blood circulation, an augmentation and acceleration of it; high temperature and a quickened pulse are its most important distinguishing features.

A greater flushing of the tissues with blood in fever may be considered a useful arrangement of nature to avert the invasion of the tissues by minute organisms or any other harmful substances.¹ When, therefore, in patients affected with mental diseases, associated with depressive symptoms, an improvement of the thinking power is observed, this can be very well attributed to a better flushing of the brain-cortex with blood, to an augmented blood-supply.

In subjects with low mentality a high fever may sometimes produce very beneficial results in improving their mental development. Such a case is mentioned by Tissot. A very stupid young man, who could not be made to comprehend even

¹ Lorand, Clinical Observations on the Origin of Fever, Lancet, November, 1907, und das Altern und seine Behandlung, IV Aufl., Seite 16.

the relation of an adjective to the noun, happened to become affected with a malignant fever and was, a few days later, able to speak a very good Latin without applying too much thought to it, and in conversation he developed ideas, such as never came to him before.²

Thus in exciting conditions during delirium and mania, in which a flooding of the brain-cortex with blood may be assumed, sometimes an extraordinary increase of mental ability may ensue. Plato, in this respect says, in his "Phædra," that delirium is actually not a bad thing at all, but rather a blessing sent by the gods.

It is a well-known fact that interpreters of the divine oracles (sooth-sayers) of Delphi and Dodona gave the greatest services to the inhabitants of Greece during a state of delirium, whereas in a normal state they were of very little use to them.

It may sometimes be observed that men of very moderate mental faculties exhibit an enormous increase of some faculties when they become demented. In conditions of maniacal exaltation there can even be revealed the ability of a genius. Marcè³ tells about a case of a young woman of a very moderate intellect who, during an attack of mania, wrote letters to her husband, which for eloquence and emotional style could very well be set side by side with the "Nouvelle Heloise" of Rousseau. The remarkable thing was, that when the patient quieted down and the attack was over the letters became of the usual form, and in comparison with those written during the attack were as if written by an entirely different person. Morel⁴ observed in some hysterical and epileptical patients during their state of exaltation an enormous activity of intelligence. Thus one of his patients, a young man, composed in one night a piece of music, and at another time a drama, which were of particular beauty. A young hysterical woman could

² Tissot, *Des nerfs et leurs maladies*, p. 133.

³ Marcè, nach Lombroso, *L'homme de genie*. Paris, 1909, S. 247.

⁴ Morel, *Traité des maladies mentales*, 1858.

recite verbatim during the period of exaltation many sermons to which she had listened, but when she became entirely quiescent it was impossible for her to repeat even a few lines.

E. Frank⁵ observed a young girl of fourteen years, who was afflicted with religious mania; she used to listen for some time to missionary sermons, and was able to talk about theological subjects as if she had studied theology; she was also able to disprove, in an intelligent manner, all the opposing arguments.

It is not rarely reported that artists, mentally abnormal, have created masterpieces which have gained world-wide recognition while they were in a state of exaltation. As a very instructive example in that respect may be considered the Greek Theotocopoulos, who lived for a long time in Spain and Italy, and who became famous under the name of Greeko (the Greek). (In the galleries of Prado and Madrid and other places his very celebrated masterpieces may be seen.)

I have in my possession an exceedingly wonderful pen drawing by an insane man whom I observed in the insane asylum of Nizza. His mind was so weak that I could keep up no conversation whatever with him. When, however, he became excited he was able to make the most beautiful drawings, for example, ideally beautiful heads of children with curly hair.

That during the state of exaltation the entirely irresponsible insane may become very intelligent was also frequently observed by Leuret. He inferred a particularly high grade of intelligence in some of his patients, because he was able to observe them only during the attack of mania, but several who had distinguished themselves by ingenious ideas during an attack proved, after having been cured, to be entirely ordinary kind of men, and in regard to intellect and mentality stood far below the level shown during the attack.

A very instructive case is the one reported by Esquirol of

⁵ E. Frank, *Pathologie interne* (after Lombroso).

a demented general. In the state of exaltation he discovered a new cannon which was afterward adopted by the army authorities. During his hours of quiescence, however, he dropped from his high intellectual state, and only wrote comedies and vaudevilles which were entirely disconnected.

Paradoxical as it may seem, there are men who become ingenious only when they lose the very low grade of intellect which they ordinarily may have. This is shown by the example of a woman observed by Winslow:⁶ when confined to the asylum she was a poetess, but when she was discharged as cured, she became a very prosaic housekeeper. The same author also observed a man who was so stupid that he could not manage simple addition examples, but during his attacks of mania he became a mathematician of extraordinary ability.

The state of inspiration in which, according to the usual assumption, artists and poets are able to do their best work, is also really only a condition of exaltation which comes very near to a mild fever. During fever, therefore, under the influence of overabundant supply of blood to the brain-cortex, in consequence of a congestion in the latter, an abnormal stimulation of the thinking power may occur. Of course, in this case various toxins also play a certain rôle.

That a great increase of blood-supply to the brain, a congestion of it, may exercise a favorable influence upon the ability to think has already been assumed by Aristotle.⁷ He mentions that through this cause men of quite ordinary intellect became poets, prophets and sibyls.

The process of thinking itself, as we know from the famous experiment of Mosso,⁸ causes an increased blood-supply to the brain. He had a man stretched horizontally on a board which was supported by a scale-like arrangement, and

⁶ After Lombroso, cited in *L'homme de genie*, 4th ed. Paris, 1909, Seite 292.

⁷ Aristoteles, *De Pronostico*, Bd. i, p. 7.

⁸ Mosso, *Sulla circolazione del sangue nel cervello dell' uomo*. 1880.

every time when the man was made to read something or to think of something, the head end of the scale dropped down. Mosso⁹ also studied the movements of the brain through an open wound in the scalp, and, after him, others, as, for instance, Frank, Roy, Sherrington, have done the same. They have found that when the man read, or was figuring or was thinking of some problem, the brain, due to the increased blood-supply and elevation of the pressure, protruded through such a wound in the scalp. Mosso has also proved, by means of a very fine measuring instrument, that the act of thinking causes the temperature of the brain to rise. Thus we see that for the process of thinking blood is required, and this must be supplied in sufficient quantity, because when the brain receives too little of it, as it is the case, for instance, after a loss of blood or in anemia, unconsciousness takes place. When we have such a case in a pale, anemic girl, and we place her in a horizontal position, then more blood flows to the brain, and with it consciousness and the thinking power return again. In case of decapitation when the blood runs out from the head the consciousness is also lost. The story that, after execution, the face of the guillotined Charlotte Corday became red with shame upon being slapped by the executioner must, as the great anatomist Hyrtl¹⁰ very justly states, be untrue, for as the executioner held the head high in the air all of the blood rushed out of it at once.

When, on the other hand, the flow of blood to the brain is great it may be followed by an increased mental excitement, which may even reach a degree of confusion, as happens in fever (delirium) or in alcohol intoxication. If, however, a rich flow of the blood to the brain occurs in subjects previously melancholic and imbecilic, where, as a rule, the circulation is a weaker one, then, as the examples above mentioned show, an improvement of the mental condition may result, at least dur-

⁹ Mosso, *Die Temperatur des Gehirns*. 1899.

¹⁰ Hyrtl, *Lehrbuch der topographischen Anatomie*. Wien, 1874.

ing the time of increased circulation. We thus see that the process of thinking is very much influenced by the conditions of blood circulation in the brain. We must, therefore, take care that during the process of thinking the brain be sufficiently supplied with blood, and that the head assumes a position which, as much as possible, facilitates the flow of blood to the brain.

We, instinctively as it were, bow our heads forward during strenuous thinking and support our bent-forward head with our hands. This is the position in which the artists generally represent a person engaged in thought. Some distinguished thinkers could best concentrate their thoughts on problems while lying down; thus, for instance, Descartes remained in bed daily until eleven o'clock, and he advised the distinguished mathematician Pascal to do the same. Descartes was, as a child, very sickly, and was confined to bed for years. In this connection one is reminded of the fact that so many of the great thinkers have been sickly during childhood, some of them being confined to bed for months. Rossini made his compositions lying in bed, and Leibnitz used to lie down flat upon the floor when he was thinking out various problems. Schiller placed his feet in ice-cold water so as to be able to work better. We know that this furthers the blood congestion in the brain. Bishop Bossuet, who was distinguished for elocutionary ability, on the other hand, used to wrap his head up with hot towels when he was thinking about a thesis. Under the influence of enthusiasm, inspiration, frequently the greatest ideas, the most powerful thoughts occur. This is a condition originating from an emotion, and is similar to a fever, whereby the pulse becomes accelerated, the face glows, the eyes gleam, and the whole body very frequently feels hot. In a great many cases great works originate under the influence of such a momentary exalted condition, such a blood congestion of the brain which may be caused by various kinds of impressions. When the great English historian Gibbon attended one evening the vespers of the Bare-footers in Rome, the songs of the Monks

in the small church in the Capitol excited him so much that he became inspired with the idea to write his great work on the destruction of the Roman Empire; a master work, hardly equalled by any other book on history, exhibiting such a wonderful power of description and a vivid way of presentation as can rarely be found in any other similar work.

There are various substances which influence the mental activity in a stimulating way, as, for instance, coffee and tea. In all probability the effect of these depends on the favorable influence which they exercise on the blood circulation of the brain. This is proved by the fact that strong coffee and tea produce insomnia, a condition in which a dilation of the blood-vessels of the brain-cortex is presupposed. According to the experiments of Mosso, during sleep there is a contraction of the blood-vessels of the brain-cortex, therefore a bloodless condition exists.

In a patient with an open scalp-wound he observed a flattening of the brain-surface during sleep, but when the patient was dreaming a protuberation of the brain through the scalp-wound could be demonstrated. It is the general assumption that a dream is the process of continued thinking during sleep. This unconscious process of thinking does not usually occur during profound sleep when the blood-vessels of the cortex are fully contracted. We dream only during the time when the sleep is not yet very deep, or when on the verge of awaking, when the circulation through the cortex has not yet entirely ceased, or, as during the morning hours, when sleep becomes lighter, probably on account of the circulation becoming again gradually established. When the circulation in the cortex attains a degree of congestion, then the dreams become confused, the same as during fever. Alcohol intoxication represents a similar condition. At any rate, many demented patients act like in a dream. We may well consider the state of mental confusion itself as a condition of dreaming in which the dreams are of confused kind. Very often, even before fever sets in,

the dreams during the night assume a confused, bizarre form and then become very horrible, as I have been able several times to observe in myself, particularly before the beginning of a feverish angina. From experience I know, that when I am tortured with such dreams I can expect with a certainty an attack of angina the next day, so that I usually, early in the morning, take some quinine to prevent the attack or at least to ameliorate it. The filling of the cortex with blood caused by a beginning of fever has undoubtedly some connection with the confused character of the dreams, though some toxic substance may also have some play.

Based upon all these observations we come to the conclusion that everything which furthers the blood circulation to the brain-cortex acts upon the thinking ability in a stimulating manner. On the other hand, everything which hinders it acts upon it in an opposite sense. Consequently the power of thinking stands under the influence of the conditions of blood circulation of the brain-cortex.

If the increased blood-flow to the brain (on one hand) stimulates the functions of the mind and exerts a favorable influence upon conditions of melancholic depression, then a diminished blood-flow and a detraction of the blood circulation from the brain can (on the other hand) diminish and quiet down the excessively increased activity of the latter as, for instance, in conditions of maniacal exaltations. In an overabundant blood congestion to the brain, favorable effects may be obtained by all means and processes which deviate the blood from the brain-cortex, as, for example, from protracted hot baths, sweating procedures, strong purgatives, venesection; the beneficial effect of a great loss of blood is to be mentioned in particular. The latter I was able to observe myself once on an inmate of an insane asylum at Nizza. A maniac had cut a deep wound on the neck with suicidal intention. He lost a great deal of blood, but the next morning his mind was entirely clear, and I was able to hold an intelligent conversation with

him. The spiritual brothers in the institution assured me that the intellect of this patient disappeared long ago, and I am much inclined to believe it, for several weeks previous to this time he had eaten up the last phalanx of his index finger. Very instructive is also in this respect another case in this same institution, for the history of which I am indebted to the superintending physician, Dr. Petri. It was a patient severely afflicted with progressive paralysis who became affected with a phlegmonosis of the foot. A severe inflammation set in, accompanied by discharge of pus and fever. An incision was made. The process on the foot healed, but simultaneous with it the mental state of the previously stupid patient also improved to a remarkable degree. His mind cleared up, and he was discharged as cured. The improvement of the mental condition was followed, however, by very much to be regretted consequences, in regard to his bodily welfare, because the patient was not able to secure any employment and he was pitifully starving. In the asylum, where he had been sure of his daily board, they would not take him back again, because he was mentally well. This proves again the truth that sometimes a diseased mind is preferable to a healthy one.

A detraction of the blood circulation from the brain can also be accomplished by sleep-producing remedies. In general these remedies (morphium), etc., have the effect of lowering the blood-pressure; less blood reaches the brain-cortex, a bloodless cortex results, and thus sleep may set in. When, however, such sleeping remedies are used for any length of time there is frequently as a consequence an extraordinary lowering of the thinking faculty, sometimes even a total stupidity, as may sometimes be observed after a constant use of bromides. A condition similar to imbecility, with symptoms of depression and striking disturbances of the memory, I have observed in a Spanish lady who took sulphonal daily for several years. These disorders of mental activity may well be attributed to disturb-

ances of the blood circulation in the brain-cortex caused by the sleep-producing remedies.

Roughly speaking, we may divide mental disorders clinically into two main groups: one with symptoms of depression, and another with symptoms of exaltation. In the first group we have to deal in a general way with a retarded and insufficient blood-supply, in the second with a too rich blood congestion to the brain. According to my observations we can notice very frequently, in inmates of numerous insane asylums, signs of a disturbance of the blood-supply in general. I found in the usual kind of mental diseases—*dementia præcox*, and in imbeciles, that the hands and feet of such patients are frequently cold, sometimes even ice-cold, of a purplish color; the hands looked puffed up, swollen, succulent. The pulse is very small and at the same time frequent.

We know, moreover, that mental disorders may originate very often on the base of disturbances of the blood circulation in general, very frequently in heart affections, and still more often in diseases of the blood-vessels. Of course, in this case a number of other factors may also participate, as for instance—in about 30 per cent. of the cases—hereditary predisposition.

How great an influence the disturbances of the state of the blood circulation in the brain-cortex has upon the origin of the mental diseases is best seen from the result of the post-mortem examinations of demented patients. In looking over the greater number of such reports there are found mentioned, as a rule, changes in the blood-vessels. Cases of mental disease in which grave changes in the blood-vessels of the cortex have already set in, as we see it, for instance, in paralytic insanity, are, as a rule, incurable, or inaccessible to improvement. In milder mental diseases, as in *dementia præcox*, the change which takes place in the blood-vessels of the cortex is not of a permanent kind. Such cases afford, therefore, favorable prospects of an improvement or a cure, and such diseases are very often of a transitory kind. Of course, even in those cases, thor-

ough microscopic examinations reveal changes in the layers of the cortex which can very well be attributed to insufficient blood-supply. Bolton¹¹ described, some years ago, a striking thinning of the second layer with a diminishing of the cells in such cases and a flatter depth of the cortex, as in imbeciles and feeble-minded. This, as well as the atrophy of the convolutions of the brain frequently found in the insane, is to be attributed to the same cause as in the case of the disappearing of any other organ, possibly to the difficulties in the proper supply of blood and the nourishment of those parts. How much the nerve-cells suffer through difficulties in blood-supply we can see best from Stenson's experiment, in which the columns of the spinal cord have been found to become degenerated through compression of the cells in the pyramids. When a nerve-cell, through some disturbance of the blood circulation, does not receive enough blood, only the finest changes can be observed in it, a swelling of the parts of the cells and chromatolysis; later a change in the position of the nucleus takes place, it changes its location and migrates to the periphery, then a formation of vacuoles takes place, and finally this disintegrates and formation of connective tissue ensues.

If one succeeds in supplying blood to the cell before it entirely disappears or grave changes have taken place in it, then the *status quo* may be restored in more or less measure. The cells of our body crave for blood, their element of nourishment, and the nerve-cells of the brain-cortex, similar to any other cells, can perform their function only when they are sufficiently supplied with blood in the proper manner. We can observe that precarious nature supplies most abundantly with blood those cells to which is assigned the most important functions. Thus we see a rich supply of blood in such a small organ as the thyroid gland. We do not need to wonder, therefore that the most delicate part of the human body the brain-cortex, the seat of our thinking power, is so very richly sup-

¹¹ Bolton, Brain, 1910.

plied with blood. According to Ranke, the brain receives about four ounces of blood, and a greater part of it reaches to the brain-cortex. The gray substance, of which the latter consists, is, contrary to the white substance, very richly supplied with blood. When Ruysch, several hundred years ago, injected the blood-vessels of the brain, he was so struck with the great richness of the blood-supply of the cortex, that he, instead of the commonly used name at that time, "glandular tissue," named it "vascular tissue." Leuwenhoek and Malpighi have also emphasized this rich blood-supply of the cortex.

It must indeed be striking to every one who sees, when the scalp is trephined, what a quantity of blood and with what force and under what great pressure it spurts out from even the finest capillaries of the cortex. The fine, very long vessels which run from the hexagonal of Willis upward to the cortex are end-arteries and branch out in the cortex in a tree-like fashion, into finest vessels and, remarkably enough, do not enter any anastomosis. The purpose of this arrangement may be to afford the possibility of a deeper thinking and to prevent the disturbance of it. The six arterial vessels, which originate from the Willis hexagonal, before they become end-vessels, give off short, thick vessels to the ganglionic portion of the brain. As it was already pointed out by Charcot¹² these vessels have, therefore, a very short journey to make from the heart to the base of the brain. The blood-supply of the base of the brain is thus much easier reached than that of our thinking centers, and therefore it may happen, as it was particularly pointed out by Meynert,¹³ that when disturbances in the conditions of blood circulation in the brain occur, as for instance during fainting, the circulation in the brain-cortex may cease, while the blood still circulates in the optic regions and in the striated bodies.

¹² Charcot, *Leçons sur les localisations dans les maladies du cerveau et de la moelle épinière*. Paris, 1876-1880.

¹³ Meynert, *Lehrbuch der Psychiatrie*. Wien, 1884.

This arrangement of the blood-vessel supply in the brain makes us also understand why disorders of our thinking power and morbid changes of the mental activity so easily occur if the slightest disturbance in the condition of the blood circulation in our body takes place. It must, indeed, be an immense task which our heart has to perform, to so push the quantity of blood (contrary to the law of gravity) far upward to the remotest parts of the brain-cortex, through the long, fine blood-vessels, and their hair-like branches, so that it may reach everywhere with sufficient pressure and in proper quantity.

That with such a construction, the slightest insufficiency of the heart-pump may easily lead to disturbance of the blood-supply of the brain-cortex, and in consequence of it to disorders of the thinking faculty, can readily be understood. I want to call attention in a particular manner also to the resistance which, besides the narrowness of the finer blood-vessels, is offered by the state of viscosity in them.

The viscosity of the blood, that means the inner friction of the blood, must naturally play a great rôle in the hair-fine vessels of the cortex, which undoubtedly belong among the finest in our body, and still I do not know that anyone has ever engaged himself in investigating this question in connection with the blood circulation in the brain.

The less viscous the blood is, the more liquid it is, and the more easily it will circulate.

If the blood is to be brought to the blood-vessels in the cortex in sufficient quantity and be circulated through the latter, the blood-pressure must be sufficiently great. In chlorosis and anemia, in Addison's disease, in insufficient nourishment during convalescence after grave diseases, after taking various sleep-inducing remedies, everywhere, where the blood-pressure is weak, the cortex is also nourished very weakly, and the mental activity in general is not very lively; sometimes it may be very sluggish.

Thus the blood-pressure conditions in the body play here

a very great rôle. Generally speaking, the observation can be made that various means which increase the blood-pressure exert also a favorable influence upon the conditions of the blood circulation in the brain and consequently upon the mental activity. We must, however, keep in mind the resistance which is offered by the fine blood-vessels of the cortex. When the latter are morbidly changed, then the blood may, under some circumstances, even when blood-pressure is good or increased, stream in mainly to the short, wide vessels which branch off from the arteries, before they continue the way to the cortex in form of long, fine end-arteries, and to which is assigned the supply of blood to the middle and lower parts of the brain; it will not reach, however, the long, fine vessels and their branches. It may then happen that objects may be seen and sounds may be heard, but mentally they are imperceptible; this is mind blindness and aphasia of words. Thus cases have been reported of a professor or a minister who, taking a manuscript from his pocket, sees the letters and words on it and cannot read them, because he does not understand them.

Peripheral sight is still possible, because the peripheral organs of sight are still sufficiently supplied with blood and are functioning, whereas in center of the mental, conscious sight,—in the cortex,—disturbances of circulation have taken place. Most frequently this has taken place in cases of arteriosclerotic or syphilitic changes in the blood-vessels of the cortex, which are also very often the causes of mental diseases. Besides arteriosclerotic changes, an important rôle in producing disturbances of mental activity, is played by increasing viscosity of the blood, its inner rubbing on the hair-like blood-vessels in the cortex, notwithstanding that, according to my knowledge, no attention whatever has been paid to this subject so far. This condition may play a certain rôle in arteriosclerosis as well as in the origin of mental diseases, as also in various diseases of metabolism, as, for instance, in gout. In the Fatherland of the Gout at least, in England, very prominent psychia-

trists attribute the cause or origin of mental diseases to uric acid. Between fully developed mental diseases and the intact mental state and between the ingenious mind and narrow-minded stupidity, there are numerous intermediate grades, in which, according to the above report, in all probability the mode of blood-supply to the cortex plays a great rôle.

We may assume as positive that for the normal function of the brain-cortex, for normal thinking therefore, a regulated blood-supply is the main requirement. With the blood the nerve-cells of the cortex receive not only important nutritive substances, like nutritive salts which for them are indispensable, lime and phosphorus, but also other highly important substances, the products of the glands of internal secretions, phagocytic and antitoxic acting substances. Upon a regulated supply of these substances depends the functioning ability of the brain-cortex, and also the origin and curability of mental disorders; in a broader sense, however, it depends on the condition of those organs which regulate this supply, and these are the blood-glands (glands of Inter. Secret.). These latter are the organs which control the blood-pressure and blood circulation in the brain, also the lime and phosphorus metabolism, as well as the immunity of the tissues toward bacteria and other toxic substances.

CHAPTER II.

THE INFLUENCE OF THE GLANDS OF INTERNAL SECRETION UPON THE FACULTY OF THINKING AND THE ORIGIN OF MENTAL DISORDERS.

IT is possible to observe that during menstruation many women are very excitable, even highly nervous. Their power of thinking is also frequently *limited*, and they are not in the mood to do anything in the line of mental work. When I once visited the Telephone Central station of a very large town in company of one of the directors who was my patient, he made the remark that at certain times some of the girls employed require great *leniency*, and that their failings may be attributed to physiological causes. During my inspecting tours through the large female jails of the United States, the matrons, in response to my inquiries, also informed me that during such time the prisoners are very unmanageable, while at other times they behave themselves very quietly.

The symptoms may be still more stormy when the menstruation is accompanied by pain or when other disturbances are present due to changes in the ovaries and in the uterus. Mental disturbances, and even true mental diseases, may break out. Such observations were made thirty-three years ago by B. S. Schultze in Jena on patients suffering from misplacements and inflammations of the ovaries and the uterus. After successful gynecological treatment a decided improvement of the nervous and mental disorders took place. When, however, there was a recurrence of the disorders of the genital organs the mental derangement could again be noted. It is, therefore, necessary in mentally diseased females to pay particular attention to the condition of the genital organs. I have observed quite frequently in many female inmates of asylums symptoms which pointed to changes or non-development of the genitalia.

So I have observed on them very flat chests; the mammary glands were scantily developed; very often there were present disorders of menstruation, lack of it or other irregularities. These are found most particularly in patients suffering from the most usual form of mental disease, dementia præcox.

It is even a common every-day observation that all changes taking place in the female genitalia cause also changes of thinking ability,—of the intellect. Young girls become very restless before the first menstruation occurs. In school they are absent-minded, inattentive, very excitable, and nothing can be done with them. Frequently the whole character becomes changed, in some a wandering desire develops, and they leave their homes without apparent cause. Others, again, develop suicidal intent, which fortunately is accomplished only in rare instances. A similar frequency of mental disorders may be observed during other periods of female sexual life, as, for instance, pregnancy and during puerperium; psychoses during pregnancy surely are not rare. During lactation, changes of mental life do occur. Mostly, however, do such disorders appear when the activity of the ovaries is at an end and menstruation entirely ceases. Then a mighty storm passes through the intellectual life of the woman; she becomes nervous, excitable; neurasthenic and hysteric troubles are then at their height, clear thinking is often disturbed, mental activity becomes almost entirely impossible, the woman cannot take notice of anything and cannot keep anything in memory, nothing excites her attention. They walk through the streets dreaming, and do not see their acquaintances when they pass them. Such diseases are still more pronounced sometimes in single women, particularly in those who pass this most difficult period in woman's life as virgins. In view of the fact that during these periods disturbances of the blood circulation also occur, characterized by congestion taking place and, as we have already pointed out in the last chapter, the influence which the blood circulation has upon the intellect, we cannot wonder that during climacterium men-

tal diseases occur so often. In such women we frequently find also changes in the secondary sexual characteristics,—for instance, a tendency to grow a beard which, as we have spoken of more in detail in our work, “Old Age Deferred,” point to disturbances of the inner secretion of the sexual glands. A very well developed case of that kind I observed only a short time ago in the clinic of Professor Ballet in the Insane Asylum of St. Anne in Paris. It was the case of a woman, 54 years of age, who had a beautiful mustache, and as a pendant a very slightly goatee (Knebel) on the chin. She begged the superintendent (Professor Lay. F.) in my presence to send her a barber, as she was ashamed of looking so much like a man before the other ladies of the ward. With the lack of the sexual characteristics is also connected the fact which I have observed very frequently, namely, that most patients suffering from dementia præcox have flat breasts.

In men we also very often see the thinking power influenced by changes of the sexual organs. So even in chronic gonorrhœa there sometimes develops a neurasthenic condition which may reach a high degree when, as often happens, the prostate gland becomes involved. The same may occur in varicocele. I observed a similar case four years ago in a young Spaniard from Barcelona, who had melancholic attacks, sometimes with suicidal ideas. His father could not begin to do anything with him in his business; he was down-hearted and discouraged, and could not learn anything because he could not memorize anything. After I ordered him to wear a suspensorium, a slight improvement in his condition took place. He felt mostly depressed on account of his impotence. In case of the latter we also see not infrequently these attacks of deep despondency with their depressing effects on the mentality. The highest degree of melancholia may then be due to certain diseases, as, for instance, in tuberculosis of the testicle, which necessitates its removal; the observation was made that patients became melancholic and committed suicide. That in case of

absence or destruction of the male sexual glands, mental diseases may occur, becomes easily understood when I mention that in dementia præcox the testes are frequently found very small, sometimes not descended. The same as in women suffering from dementia præcox, the sexual characters in male patients are also undeveloped, and such individuals frequently manifest an infantile appearance in general. The mustache is very sparse, even when they are over 30 years of age. Sometimes female patients with dementia præcox appear like boys or men, whereas in some male patients with dementia præcox the face is more womanlike, or, even at the age of 30, like that of a boy. The castrated also not rarely show similar features. I have also in mind those male persons in whom the sexual glands are congenitally insufficiently developed, or because descension has not taken place, cannot be felt at all. Such persons are easily recognizable as of that special eunuch type already mentioned in my work on "Old Age," and which, therefore, need not again be described. Almost all manifest a mental inferiority, and of the number I have personally observed all showed signs of weak intelligence. Those of poor circumstance never attain any success, but are fitted only for lowly positions. Such subjects also are usually stunted in growth. Of this infantile type, those who grow tall, usually have a short chest with long arms. Sometimes there is found a degree of intelligence and not rarely among them individuals with education, but this is more or less of an imitative kind, similar to what we find in children; by great diligence they may be able even to obtain the degree of lecturer—I know such infants in such positions, but however diligent in working out a given thesis, their work does not by any means show any originality in thinking. In regard to castrates, their intelligence depends particularly upon whether they have been castrated in early childhood or only later, as, for example, the poor Abelard. We will take up this question in the chapter on the influence of sexual impulse on the intelligence. In those who

were unfortunate enough to lose manhood later in life through disease, by accident or force, as frequently happens in the States of South America—very often melancholia and suicide ensue. The most frequent cause of the disease here is tuberculosis of the testicle. Luckily enough at present testes are not removed any more in their entirety; a part of it remains, because we know that even parts of a ductless gland, when they only reach a certain size, may replace the whole gland. We are also able nowadays to cure tuberculosis of the testicle without any operation, by sun treatment in places where the sun rays are acting most intensely. Castration in women takes place more frequently than in men. Fortunately times are past when hysterical women and girls were castrated to cure hysteria. Every conscientious surgeon is nowadays also very anxious to retain at least a small portion of the ovaries. I have observed a number of women with only one ovary without noticing any deviation from normal intelligence. In those, however, in whom both ovaries have been removed one can notice, not rarely, of course only years after the operation, an abatement of their intellectual abilities. Last summer I observed a case in which both ovaries were removed ten years ago. The case in question was that of a French lady of 42 years of age, who had formerly been gifted with particular mental efficiency. In recent years a noticeable downfall of her mental faculties has taken place. First of all, her memory suffered very much; she could not keep in mind anything I was telling her, even the least advice I gave her I had to write down; notwithstanding all detailed explanation she could understand even the easiest things only with difficulty. She was dull in perception, and also helpless to the greatest degree in all she undertook, even in her movements. She assumed that she could not walk well, notwithstanding the muscle and nerve activity of the legs had manifested nothing pathological. She actually drove around in a carriage the whole day; even for what would have been a

three-minute walk she had to take a carriage. It was as if she had forgotten the use of her legs altogether.

Not infrequently we may find a significant lowering of mental faculties in women in whom the sexual glands have ceased their activity through physiological processes, as, for instance, in climacterium. In most women menstruation ceases at the end of the fortieth year; in many it still lasts several years, in others again old age changes occur in the middle of the fortieth year, particularly in old maids or widows of long standing. In such persons one can observe not rarely a certain limitation of mental perception and judgment; they are sometimes peculiar or are entirely apathetic, retired into themselves, and care very little for the happenings in the outside world. Very frequently they are very, very religious and become real praying sisters. Their religion is, however, actually more a superstition, devoted only to the *appearance*, because they have not the necessary power of perception to grasp the essential basis of the religion. Very many of the once-upon-a-time feted beauties who at the time when they were at the height of their glory should have gone to confession on account of a full register of gallant sins which they committed, but who never thought of taking that step, are doing it so much more diligently now, confessing sins which they only wish to commit, or have done only in thought, because to the real committing of such, unmerciful nature, which has set a time limit to everything (everything on earth is only temporary) offers them no more opportunity.

In men the sexual activity, for causes given more fully in our book "Old Age," does not become diminished even when advanced old age is reached. In regard to this point we are, therefore, placed more at an advantage than women; in the latter the influence of the sexual life upon the welfare of the body and mind is actually a more profound one. Many of their bodily and, still more, of their mental ailments come from that source, and in fact many of their complaints can be cured

by attacking them from that point. How great this influence upon their mental state may be seen from the fact that mental diseases occur much more frequently in women than in men. Demented women, and women criminals as well, are often very much more difficult to treat than men, so that once a Belgian colleague, when I visited the male asylum under his supervision, said to me, "Thank God that I have no demented women under my care." This great difference may, in my opinion, be attributed to the fact that changes in the sexual glands of women, to a much greater extent than in men, exercise an unfavorable influence also upon another very important ductless gland, that is the thyroid gland. Thus we see an increase of activity of the thyroid after various changes of the sexual glands, and may observe a distinct swelling of the thyroid in 12- or 14-year-old girls before the first appearance of menstruation; this may be noticeable in many young girls, and also in women during each menstruation, and still more distinctly in pregnancy. It may come to a development of real goiter, which may make its appearance during puerperium. Various morbid changes of the ovaries, very frequently also inherited weakness (insufficiency of the ovaries) may cause such a swelling of the thyroid gland. All these changes of the thyroid are, as a rule, associated with changes in the thinking ability, and not rarely they are followed by real mental diseases. The impulse for wandering in young girls during puberty we have already mentioned. Sometimes they manifest a depressed melancholic condition associated with suicidal ideas. In some young girls there is found a state of ovarian insufficiency, menstruation begins very late, and at the same time there exists a number of bodily symptoms which I have described in detail in my book on "Old Age," and which also indicates the existence of deficiencies in development of the body. In such individuals we also observe very poorly developed intelligence; they are very slow in perception in their studies and the teachers have difficulty with them. If later the menstruation sets in, they

have very much pain during such periods; the menstrual periods are irregular, either too strong or too weak or lacking for several months. All these disturbances react on the mentality. Simultaneously with dysmenorrhea or amenorrhea very often in these girls may be observed symptoms of chlorosis. Von Noorden, Dalch and others attribute the latter to changes in the ovaries, particularly to inherited weakness of them. In my opinion they are also due to the changes in the thyroid gland, which is very often noticeably and distinctly swollen. These disorders become much more pronounced in cases of pregnancy where a true struma forms with symptoms of Basedow's disease. Cases of mental disease in such conditions are very frequently reported. Also the highly nervous disorders, which occur during climacterium and, more or less, make thinking more difficult, are undoubtedly in relation to the increased activity of the thyroid gland during the climacterium. This manifests itself by great increase of the pulse, frequently heat sensation (congestion), sweats, high state of nervousness, etc.

That the thyroid gland influences the mental ability to an extraordinary degree is best demonstrated by the example of cretinism. The cretin very frequently has a very large struma. This, however, is not due to an increase of the thyroid activity, as is the case during pregnancy or in Basedow's disease, because, while in the latter it depends on increased activity of glandular tissue, in the cretin it consists of entirely inactive tissue, namely, connective tissue. In the struma of the cretin there can hardly be found normal tissue any more; it is all connective tissue, or one which has undergone colloid degeneration. The proper function of the thyroid depends on its content of normal colloid substance.¹ As I have shown already years ago, a thyroid which contains no normal colloid, contains also no iodine. The organic iodine of the thyroid plays the greatest rôle in the activity of that gland. A strumous degeneration of the thyroid may, as we have seen, often be demon-

¹ Lorand, Old Age.

strated in patients with mental diseases. As, for instance, I found years ago in the Asylum of Pontiac, in the State of Michigan, United States, very well developed strumæ in a large number of female patients, namely, in 100 out of 600 patients with dementia præcox and melancholia. Since then I have repeatedly found this in such patients, and have found menstrual diseases or disorders of the sexual organs in conjunction with more or less developed swelling of the thyroid gland in a great number of female inmates of various asylums, particularly in cases of melancholia and dementia præcox. Such patients are also much more restless during menstruation; others, again, manifest an improvement of their mental condition. This is undoubtedly caused by the increase of thyroid activity during that period. If, therefore, mental diseases are caused by inactivity of the thyroid, as it is not rarely the case in dementia præcox and melancholia, then the improvement during the menstrual period becomes easily understood. In other idiots—I examined a number of them in the city asylum at Nizza—I could find no thyroid at all, notwithstanding my searching for it on both sides of the neck and penetrating deep into the clavicular grooves with my hands, and notwithstanding that the patients were very much emaciated. A struma consisting entirely of connective tissue, degenerated thyroid-gland tissue or an entire absence of the thyroid amount to the same. In both conditions the human being is stupid, like an animal; nay, a mentally normal dog is much more advanced in regard to mind than such a human creature. Such idiots are, in most instances, born that way. They come into the world without thyroid, so to say, and at the *post mortem* no thyroid at all is found or only a meager trace of it. There exists, therefore, an inborn aplasia of the thyroid. These children have a general typical look. Their faces show very little humor; through the wide-open mouth can be seen a thick, swelled tongue sticking out, the abdomen is very much distended. These individuals remain very stunted in their growth,

and at the age of 20 still look like small children. Mentally they stand on the lowermost grade, they cannot talk, and their pleasures and displeasures are expressed by a kind of grunting and by means of inarticulate sounds. A case of this kind was a Russian Jewess, whom von Eiselsberg² presented to the Vienna Royal Society of Physicians. It was a girl who was only 30 cm. tall, her skin was scaly, the forehead was covered with hair; this creature gave only unconnected inarticulated sounds. The thyroid could not be felt at all.

The condition which these children manifest we call congenital myxedema. Now, everything in the world has its cause, and such a condition does not come of itself; it is not that nature made here some obscure blunder, but man himself is at fault, and it is either the father or the mother. In most instances the parents of these children have induced degenerative changes of their thyroid gland through years of continued drinking of much alcohol, or through lues, and did not undergo radical treatment before marriage. Lues attacks the thyroid in a most particular way in its secondary stage; one can frequently see symptoms of fever, and particularly in women one can observe also a slight, sometimes even a very pronounced swelling of the thyroid. These changes of the thyroid are, moreover, transmitted to the children the same as changes in all other ductless glands are transmitted in general.³ Perrando⁴ found a degeneration of the thyroid in the newborn of luetic parents.

As the investigation of Roger and Garnier,⁵ and many others show, all infectious diseases injure the ductless glands, and in the first place the thyroid. First it comes to an over-activity with symptoms similar to those which we observed in Basedow's disease; later, however, it comes to a state of ex-

² v. Eiselsberg, Wiener Gesellschaft der Aerzte, Sitzung 7, Juni, 1912.

³ Lorand, Kongress für innere Medizin, 1903, Wiesbaden, und das Altern.

⁴ Perrando, Sulla struttura della Tiroide. Sassari, 1900.

⁵ Roger et Garnier, Presse médicale, 15 Avril, 1899.

haustion, and then to the conditions which we identify as myxedema. Simultaneously, however, important changes in the thinking faculty take place. According to Pils⁶ the psychological symptoms of such a condition are: slowness in thinking, apathy, weakness of memory, sleepiness. In mild degrees of this disease, before it was fully developed, Murray,⁷ and after him Hertoghe,⁸ have described hallucinations; the patient believed that he saw mice and rats running through the room. Suicidal inclinations have also been observed by these as well as other authors. I have seen in most of such patients a melancholic disposition. They were so apathetic that they could not take a step without thinking about it. Rising from their seats was to them quite a trouble. The speech was very slow, the voice entirely soundless. Such a case of still undeveloped myxedema I saw in Professor Pel's department in Amsterdam, who called my attention to the entirely soundless voice of a patient, as well as her ice-cold nose. The color of the face was a ghastly palor. I might compare this paleness of patients with myxedema, or the castrated, and those suffering from weakness of the testicle, to the paleness of a fish's abdomen. Undoubtedly this is connected with the weakness and great slowness of the blood circulation.

These fully developed cases of myxedema are altogether rare. Unfortunately they are very frequently considered as chronic Bright's disease, to which Professor Marchiafava, with perfect justice, called attention only recently. Undeveloped cases of simple weakness of the thyroid—hypothyroiditis—are, on the contrary, much more frequent. What is present in the highest degree in myxedema we see here less developed; only the individual symptoms are more or less pronounced. We see that distinctly in regard to disorders of the memory. In fully

⁶ In Oppenheim, *Lehrbuch der Nervenkrankheiten*, IV Aufl. Berlin, 1905, S. 1382, Bd. ii.

⁷ Murray, *Diseases of the Thyroid Gland*. London, 1900. S. 97.

⁸ Hertoghe, *Der chronische gutartige Hypothyroidismus*. Lehmann, München, 1898.

developed myxedema the typical point of the disorder is that all occurrences during youth are kept in memory very well, whereas new impressions are not noticed, and also not taken in and fixed in the memory. We can observe something very similar to it sometimes, in some forms of hypothyroiditis, whereas in other cases this disability has not yet become very far advanced. It is generally very difficult to separate these two conditions from one another, because they frequently pass into one another. Particularly in hypothyroiditis, that means in the chronic, benign weakness of the thyroid described by Hertoghe, all these symptoms are very seldom found in the same person. Children of such persons with myxedema manifest frequently the symptoms of congenital myxedema or of infantilism, an inborn weakness of the sexual glands. Very frequently they show adenoid vegetations in the nasal pharynx; in general the offspring of myxedematous parents present a lymphatic appearance. In regard to mentality, children of myxedematous parents, even those afflicted only with hypothyroiditis, are not well off; they are, as a rule, backward in their studies; we will consider that subject later on in a separate chapter. This lymphatic appearance, as well as the deficient bony framework; the long, narrow chest, and the underdevelopment of the lungs which is caused by it, expose these children to tuberculosis. In fact, Pel⁹ has very frequently found tuberculosis in the families afflicted with myxedema. We gain here an insight into the relations which exist between tuberculosis and mental diseases, and undoubtedly these two affections occur in the same families quite frequently.

That we can attribute this disturbance of the thinking ability, in the above-mentioned processes, to the changes in the thyroid, is already proven by the fact that in most cases a marked improvement of the mental faculties can be noticed when animal thyroids are given to the cretins, the idiots, and those suffering with myxedema, be it congenital or acquired.

⁹ Pel, P. K., "Myxædem," in Volkmanns klin. Vorträgen, 1891.

Also in a large number of mental diseases, as we will still consider later, a marked improvement, and often a cure, of the condition has been obtained by treatment with thyroid. If, however, the treatment of patients with myxedema is discontinued, the disturbances again return. A further confirmation we find in the experimental fact that animals in whom the thyroid has been removed, particularly when this is done in infancy, remain backward not only in bodily development, but also mentally, and have a stupid appearance. Grave changes in the central nervous system are also taking place, particularly in that part of it to which we, according to our present state of knowledge, attribute the seat of intellectual faculties, namely, in the brain-cortex. Albertone, Tizzoni, and Walter Edmunds have found in such animals, and Whitwell¹⁰ found on subjects suffering from myxedema, grave changes of the nerve-cells in the third and fourth layers of the brain-cortex, chromatolysis, loss of the processes, destruction of the nuclei; finally a new formation of connective tissue takes place, which substitutes the destroyed, more delicate tissues. We see thus that here a group of gravest changes have taken place at a point where the injury done (in case we have to deal with the highest grade accompanied by the loss of the nucleus) cannot be repaired. In post-mortem examinations of demented patients changes in the thyroid and other ductless glands can, according to the investigations of V. D. Scheer, also be demonstrated microscopically. He found,—he gives illustrations of it in his recently published Thesis on Osteomalacia and Psychoses,—in four cases of mental disease very important changes in the thyroid gland: colloid degeneration, great increase in connective tissue, papillary cell proliferation in the follicles; in one case there was no longer any colloid in it. He also found changes in the other ductless glands. What rôle the thyroid has, as a direct cause of mental changes, is seen in this fact, among others, that a number of causes, which we consider as typical

¹⁰ Whitwell, *British Med. Journal*, 1897, Feb. 27.

for the origin of mental diseases, are at the same time considered as particularly injurious to the activity of the thyroid. The most important of these are the infectious diseases, particularly lues, toxic influences of various kinds, particularly alcohol, changes in the sexual glands, conditions of exaltation, changes of old age. In the beginning an increase of activity of these glands, with a number of Basedow-like symptoms, may be observed, but later in the course an exhaustion of the gland, even an extinguishing of the volcano takes place, and then a myxedematous condition follows, be it a simple weakness of the gland as in hypothyroiditis or a fully developed myxedema. Accompanied with it may also be extensive disturbances of the mental condition, as we are able to observe in various kinds of mental diseases.

Mental diseases, as I have pointed out in my other publications, are caused, however, not only by changes in the thyroid and sexual glands, but by changes in all ductless glands. There exists, as it has been established by Pineles,¹¹ Lorand,¹² Falta, Eppinger, Rudinger, a kind of correlation between the various ductless glands; if one of them is changed, the rest of them, one after another, become changed. Pineles first established this fact by clinical observation and the author of this book¹³ by experimental research in Professor Minkowsky's Laboratory. If from an animal in which diabetes was produced by removing the pancreas, the thyroid is removed and examined, signs of overactivity are found in it. I have also shown¹⁴ in my later contributions that in diseases of the ductless glands we have to deal not with disorders in one of the glands, but with changes of a higher or lower degree in all of

¹¹ Pineles, *Jahrbuch der Wiener Krankenanstalten*, 1897, Seite 256, 258.

¹² Lorand, *Internationaler Medizinischer Kongress*, Madrid, 1903, und das Altern.

¹³ Lorand, *Die Entstehung der Zuckerkrankheit und ihre Beziehungen zu den Veränderungen der Blutdrüsen*, Berlin, 1903.

¹⁴ Lorand, *Comptes-rendus de la Société de Biologie de Paris*, 1904, und Sitzung der London Path. Society, 1905, Febr. 11. In *Transactions of the London Path. Society*, 1905.

them. And thus we find that in mental diseases all ductless glands are more or less affected, while the starting point may be in one or the other of them; mostly it is the thyroid or the sexual glands, but disturbances in the others follow one another in succession, until we find the respective complexity of symptoms well expressed, so that we frequently see, after changes in the sexual glands, changes in the hypophysis taking place. On the other hand, we find in disease of the latter, in an overactivity of it in acromegalia morbid changes in the sexual glands taking place, a final ceasing of menstruation very frequently, whereby atrophy of the ovaries may be surmised. But, also, in the thyroid and also in the adrenals changes may take place. According to my observations all cases of acromegalia are associated with morbid changes in the thyroid; sometimes, however, even a large struma (goiter), cannot be felt during life, but in a post-mortem examination such is found under the sternum.

According to the nature of the thyroid one can distinguish two principal kinds of acromegalia,¹⁵ one grouped with symptoms of Basedow's disease and another one with symptoms of myxedema. Acromegalia itself is surely caused by changes of the hypophysis, namely, through overactivity of the latter, the starting point may be in the sexual glands or in the thyroid. In cases of overactivity of the thyroid we sometimes may notice an increase of intellectual faculties; an example of it I have already briefly described.¹⁶ It was a case with one of my friends, a lawyer and real estate owner, Mr. S. G., in Vienna, whom I was able to observe during the sixteen years' duration of his illness. The symptoms of acromegalia appeared in that patient after a severe mental shock; the same etiology was stated by Pel¹⁷ in a case observed by him. Three years later

¹⁵ Lorand, Neurologische Sektion des Internationalen Kongresses zu Madrid, 1907.

¹⁶ Lorand, Old Age.

¹⁷ Pel, Ein Fall von Akromegalie in Folge von Schreck. Berl. klin. Wochenschrift, 1891, p. 51.

diabetes set in, which very soon took a grave course and lasted over twelve years, which is a very rare exception. The examinations of the urine which I made very frequently revealed a large quantity of sugar, acetone, and acetic acid. During many years besides the severest headaches there have been Basedow-like symptoms, sensation of great heat, so that he had to sleep without covers; tachycardia, profuse sweats, great tired feeling. In later years eye-symptoms, hemianopia, became very noticeable, and finally, a few years before he died, blindness set in. I want to emphasize particularly that the superior mentality of the patient, who was a much-sought lawyer, had during the first years, with the exception of the times of the severe attacks of headache, scarcely suffered at all, excepting possibly that he became more conservative in his views, and did not undertake anything new. Indeed, his ability of exercising sound judgment seemed apparently to be more increased, so that all his friends, myself included, have sought his opinion in all difficult problems, and actually his advice was always right. Gibson,¹⁸ of Edinburgh, has also noticed in one of his patients, who was afflicted with the disease for a number of years, a particularly great intelligence. Moreover, one of our English colleagues, Dr. L. P. Mark, who has been affected with acromegalia for several years, offers us a very striking example in that respect. In a brilliantly written monograph he describes for us the history of his own illness, and Professor Max Sternberg, in his criticism published in November, 1912, in the *D. M. W.*, praises very highly the intellectual faculties of the author.

We see thus that in cases of overactivity of the hypophysis, as a rule, no lowering of the mental faculties takes place; on the contrary, the latter are unchanged, and sometimes increased. Indeed, we cannot wonder at that, because we know that the hypophysis acts as a regulator of the blood circulation as well as of the lime and phosphor metabolism, similar to the thyroid gland. Sometimes, it is true, when simultaneously

¹⁸ G. A. Gibson, *Edinburgh Med. Journal*, 1889, p. 505.

symptoms of myxedema are present, the disease may exercise an unfavorable influence upon the mental condition. A similar case which I have observed was that of an American gentleman, who was the chief of one of the largest manufacturing plants in the United States. His associates complained to Professor Dercum, who directed the patient to me, that the patient interfered with the progress of the business of the large concern. He opposed all interventions, so that his associates had the greatest difficulty in procuring new machinery, or advancing new plans in conducting the business. The conservative judgment of this patient had reached in this case such a degree as to become detrimental. Such a case of acromegalia may set in with symptoms of a beginning myxedema, or the cases with Basedow symptoms may be a transition to it. In the above-mentioned case the turbulent symptoms have ceased in later years, but notwithstanding the fact that the patient was a millionaire, he was very much inclined toward miserliness. Of course, avarice is a faculty which is more liable to be found associated with conservatism than with the faculty of imagination! Those who are blessed with a great power of the imagination are more inclined toward liberality. By this example we also see how nearly the faculties of temperament and mind are related.

Simultaneously with slight disturbance of the thinking faculty in acromegalia, there may develop sometimes true forms of mental diseases. Such cases have been reported repeatedly within later years.

More or less pronounced disturbances of the normal thinking power may be observed also in changes of other ductless glands, the adrenals, for instance, as I was able to observe myself on some, either fully or not quite fully developed cases of Addison's disease. In this disease the most noticeable symptoms, besides the typical coloring of the skin, is an enormous feeling of fatigue. With the great bodily fatigue is frequently present a mental one. In the last case of Addison's disease

under my treatment, in a gentleman, Mr. B., from New Orleans, in whom the diagnosis could be established by the typical coloring of the mucous membrane of the mouth cavity, I found a striking mental dullness, the speed of the thoughts was retarded, no interest whatever in the events of the outside world, weakness of memory. According to the assurance of patient's wife these changes became manifest only sometime after the disease set in. In such patients tuberculosis sometimes sets in, and, on the other hand, in many cases of chronic tuberculosis, frequently degeneration of the adrenals may be found in advance, which is possibly manifested in some tubercular patients by the appearance of pigmentation of the skin. This is, therefore, another proof of the possibility of a relation between tuberculosis and mental diseases. The adrenals, as well as the thyroid, are organs of immunity; they protect us against the various infections, and I have already called particular attention ten years ago,¹⁹ and later at the Congress on Tuberculosis, in Paris, in 1905, to the important etiological rôle of degeneration of the thyroid in the origin of tuberculosis, a view which, according to recent literature, is at present generally accepted.

Generally speaking, all ductless glands are organs of detoxication, the same as the epithelial bodies, the liver and the kidneys. If these organs are degenerated, then we see the counteraction of the poisons which are not eliminated or destroyed in the system. Spasms occur and mental confusion takes place. The epithelial bodies play a great rôle in the origin of tetanic spasms, and, according to Pineles and other authors, also of epileptic and eclamptic spasms. Laignel-Lavastine²⁰ have found changes in the latter diseases, also in various mental disorders. He reports eosinophilia of the cells of the epithelial bodies in a case of senile dementia, which was

¹⁹ Lorand, Rapport de la Thyroïde avec la Tuberculose et le Cancer, Journal Medical de Bruxelles, 1903.

²⁰ Laignel-Lavastine, Encephale, 1912, S. 481.

absent in other similar individuals. Similarly, changes of the liver may be associated with mental diseases. This organ detoxicates a whole number of injurious substances, poisons, either coming from the outside or originating within the body as waste product of the metabolism. In cases where destruction of the immunizing liver tissue has taken place, not infrequently mental disorders follow; for instance, I saw in the ward of Colleague Seno, in Antwerp, a maniacal patient with atrophic cirrhosis of the liver. But in such patients (I saw quite a number in Carlsbad) in whom cirrhosis has lasted for a long time, and the organ has begun to become smaller, I have frequently observed a lowering of the thinking power, mental dullness, weakness of memory, and sometimes great agitation, insomnia.

If the elimination of the various poisons originating in our bodily economy cannot take place on account of diseases of the kidney tissue, a retention of them takes place. For this reason, and particularly through the lack of the immunizing inner secretion of the kidney, uremic spasms with disturbances of the consciousness and mental confusions may take place. In course of chronic Bright's disease, not infrequently, besides uremic attacks, disturbances of the intellect occur.

We thus see that changes of the intellect are in very close relation to changes in the ductless glands, and this becomes so much easier to understand when we think that all those functions, which according to our present knowledge, when changed, may give rise to mental diseases, are all regulated by the ductless glands. In the first place we may mention here the toxins of various origins. We know from the investigations of Lugaro and others that various kinds of poisons exercise an injurious influence upon the cells of the brain-cortex, and, through their strong or lasting action, may come more or less grave changes, and even injuries to the most important component parts of it.

Against these injurious substances, whether they are of bacterial origin or are introduced into our body with food or

drink (alcohol) or in form of medicines, we are protected by the ductless glands. I have considered this subject more in detail in the chapter "On the Ductless Glands, Their Influence upon Immunity Against Infection and Intoxication," in my book on "Old Age," and will not repeat it here. But they protect us also against the poisons produced in our own bodies as a result of the process of metabolism. We know, through the work of Blum²¹ and the Japanese Kishi,²² that the thyroid immunizes the poisons of albumin metabolism. Through its activity the elimination of the nitrogen is increased, in the same way also uric acid, as I also was able to notice in my patients whom I fed with thyroid extract. But the elimination of salt is also increased, as is seen from examination of urine of such patients, and we know that salt plays a great rôle in many processes accompanied with disorders of mental activity, as, for instance, in epilepsy.

The liver and phosphorus metabolism, disorders of which play a very great rôle in the origin of mental diseases, is also regulated by the activity of the ductless glands, but of this subject we will speak later in the book. Of particular importance, however, for our consideration here, is the strong influence the ductless glands have upon the blood-pressure and blood-circulation in the brain, the importance of which we pointed out in the last chapter. The adrenals, as is known, by means of the secretion which they deliver to the blood, elevate blood-pressure. During great *mental irritation* an excitation of the sympathetic nerve takes place. This is the main nerve of the adrenal, and by its *excitation* an increased supply of secretion into the blood is produced, and thus an elevation of the blood-pressure. This assumption, which I expressed in a paper presented to the Royal Society of Brussels ten years ago,²³ has

²¹ Blum, Pfluger's Archiv, 1902; Archiv f. Physiologie, 1902.

²² Kishi, Virchow's Archiv, 1904.

²³ Lorand, L'origine du Diabète et ses rapports avec les états morbides de glandes vasculaires sanguines. Bulletin de la Société Royale des Sciences médicales et naturelles, Bruxelles, 1903; Deutsch bei A. Hirschwald, Berlin.

recently been confirmed by exact experiments of Professor Asher in Berne. This produced elevation of blood-pressure has great influence upon the blood circulation in the brain, causing a dilatation of the brain blood-vessels. The secretion of the hypophysis also increases the elevation of the blood-pressure. Of great significance is also the influence of the thyroid.

According to some authors, as, for instance, Oliver and Schaefer, it lowers the blood-pressure; again according to Faltz it elevates. According to my own observation such an elevation takes place only by giving large doses of thyroid. For a number of years I have been taking thyroid at intervals to learn its action from personal experience. I was only able to observe that when taking larger doses for some time I obtained a blood-pressure of 140-150 mm. measured after Riva-Rocci, while in the free intervals my blood-pressure was 120-125 mm.

According to experiments of von Cyon,²⁴ reported in Pflüger's *Archiv*, who worked considerably with thyroid, the latter exercises a regulating influence upon the blood circulation in the brain.

If, then, disturbances of the thyroid activity occur, disturbances of circulation in the brain-vessels take place. This may serve us as a base for a better understanding of the statement made in previous chapters about the favorable influence which fever has upon mental diseases. In fever we also have an increased activity of the thyroid, and this causes the destruction and elimination of the toxic products.²⁵

Of the greatest importance is the powerful influence of the thyroid upon the blood formation. After its removal we observe in animals a reduction of the red corpuscles, and later also of the white ones. In man also a similar condition was observed in degenerative conditions of the thyroid; when, however, the thyroid extract was administered an increase of the

²⁴ E. von Cyon, Pflüger's *Archiv*, Bd. li.

²⁵ Lorand, *Clinical Observations on the Origin of Fever*, Lancet, 1907, Nov., und das Altern und seine Behandlung.

red blood-corpuscles took place. The frequently observed decrease of the number of red corpuscles in melancholia can be attributed to it, and also brought into connection with changes in the ovaries, as the same decrease was observed in animals which were castrated.

On the other hand, Spielmann and Etienne²⁶ were able to increase the number of the red blood-corpuscles by administration of ovarian substance. Very important is, further, the great influence which the thyroid has upon the formation of the elements of the blood which form the defense against infection and other toxic substances. Phagocytosis is very much influenced by an active thyroid. In the bacteriology laboratory at Luttich, Fassin found that the alexins are wanting when the thyroid is extirpated.

Sir A. Wright, the founder of the opsonin theory, attributes to the thyroid the most important rôle in the formation of the opsonins. In the Pasteur Institute, Stepanoff and Merle could prove by experiments that the opsonins are not formed in animals in which the thyroid was removed. On the other hand, these investigators were able to increase the formation of opsonin by administering thyroid. This confirms also by experiments the theory advanced by myself, that fever is a beneficial action of defense against infection, associated with an overactivity of the thyroid. The good results of hyperleucocytosis in various kinds of mental diseases, for example, in a great number of paralytics in the Institute at Steinhof, after acute infectious diseases, as reported by Wagner, Piler, Silberhuber, and Bedard, in the annual convention of the German Society of Psychiatry, in all probability depend on nothing else but an increased activity of the thyroid caused by the infection. From the results of the investigations of a number of investigators, as Roger, Garnier, Torri, and others, we know that the thyroid shows an overactivity with great increase of the colloid

²⁶ Spielmann und Etienne, III Congrès Français de Médecine interne, Nancy, 1896, 8 Aug.

substance in the follicles, which ooze out in quantities into the surrounding lymphatics. And the colloid substance is the active product of the thyroid.

Summing up all statements made above, it is apparent that *changes of the ductless glands play a very great rôle in the origin of mental diseases*, a fact to which I called attention in my previous work years ago. *The ductless glands dominate and regulate all these functions, changes in which form the direct cause of mental disease.*

CHAPTER III.

THE INFLUENCE OF THE NASAL CHAMBERS UPON THE CIRCULATORY CONDITIONS IN THE BRAIN AND THE ABILITY OF THINKING.

ANYONE who studies the anatomical conditions in the nose closely must be impressed with how richly the organ is supplied with blood. We find here enormously developed venous networks forming distinct spongy bodies, so that in this respect the nose may be compared with the penis. Moreover, Vieussens,¹ many centuries ago, pointed out the similarity of this venous plexus in the nose to that found in one of the constituent parts of the female reproductive apparatus, the placenta.

In view of the fact that nature in all her creations acts with admirable ingenuity, it must be assumed that in this peculiar construction of such a small organ she has pursued a special purpose. Up to the present time it has been mostly assumed that the rich blood-supply serves the purpose of warming up the cold air which entered through the nasal openings. I am convinced that this view is an erroneous one, because, in the first place, it is a fact that the main stream of air does not pass at all through the inferior nasal channel, in which most of the blood-vessels are situated, a fact which was particularly brought out by Zarniko² in the description of the anatomy of the nose in his textbook on diseases of that organ. On the other hand, such a warming up of the air would only find its application with respect to the inhabitants of the cold regions, and even in those only during certain seasons of the year. In the inhabitants of southern countries or of the tropics such an extravagant supply of blood-vessels would, from the point of view stated above, have no sense at all. To my knowledge, the

¹ Vieussens, *Neurog. Univ.*, lib. i, cap. xvi.

² Zarniko, *Lehrbuch der Krankheiten der Nase*, VI Auflage, 1913.

noses of the inhabitants of the tropics are in no way less richly supplied with blood-vessels. Moreover, I would like to call attention to the fact that the blood-vessels in the nose are almost all only of the venous kind, and that there are very few arterial vessels present.

This rich supply of venous blood-vessels must, therefore, have another purpose, and when one studies the anatomical conditions in the nose more closely a highly significant fact is observed, namely, that the venous network in the nose anastomoses or intercommunicates with the venous network of the brain-membranes by means of the ethmoidal veins. The latter, the *V. ethmoidalis anterior* and *posterior*, enter the cavity of the skull through the foramen anterior and posterior and then enter into the venous network of the dura and pia mater; particularly to be mentioned is also the vein of Zuckerkandl, which accompanies a side branch of the ethmoid artery. Besides, there exist connections of the circulation in the nose with the blood-sinuses; for instance, with the longitudinal sinus. I am also of the opinion that the finer diploic veins located in the bones forming the border line between the nose and the cavity of the skull are not without significance in the formation of anastomoses between the circulation in the nose and the skull.

So much is certain, that between these two venous networks, the upper one at the brain and the lower one in the nose, there must exist some relation, and it is surely a clinical expression of this relation when, in a case of congestive hyperemia of the brain, nose-bleeding occurs. This, for example, occurs after mental strain or in a suppression of menses, in typhoid fever, etc.

We can also make the interesting observation that previously existing headaches, no matter how severe they may have been, will disappear after such a nose-bleeding. We may justly consider the occurrence of nose-bleeding in these conditions, similar to other symptoms in disease, as an expression of a self-restoring attempt of the organism. It is a rational basis

for our therapeutic interference when we follow such indications given us by nature, and try to imitate them by attempting to create similar symptoms with our therapeutic measures. When, therefore, congestions of the brain and severe headaches usually disappear after copious bleeding from the nose, it would be rational to produce such bleeding artificially. At present, however, venesections—possibly unjustly—are not in use. We prefer nowadays to use the bloodless methods, such as strong purging, sweating, etc. According to my experience we can use in the nose similar means, by applying snuff remedies, which will irritate the nasal mucous membrane and produce copious discharge from the nose. I have actually succeeded in such cases,³ on myself as well as on a number of patients, in making the most severe headaches entirely disappear by such means; the more copious the discharge the better was the result. Once I suffered from an attack of very severe migraine of the right side with excessive headache; after using a snuff powder with 0.10 veratrine, I began to sweat violently and a very profuse discharge, which was almost pure water, came from the nose; undoubtedly that watery fluid was extracted from the blood, and I thus drained off blood through the nose, receiving a reaction similar to the one which takes place in spontaneous nose-bleeding in congestive conditions in the brain. But, besides draining off blood, I also drained off lymph, and from the investigations of Key and Retzius⁴ we know that close relations exist between the lymph-vessels¹ of the nose and those of the brain-cavities. The old Master of Medicine, Vieussens,⁵ in his discourse of the anatomic-histologic relations in the nasal mucous membrane, which he described as a net-like membrane with innumerable fine openings, also mentions that these openings are there for the purpose of removing the lymph. In man,

³ Lorand, *Münchener med. Wochenschrift*, 8 Okt., 1912.

⁴ Key und Retzius, *Studien über Anat. des Nervensystems und Bindegewebes I.* Stockholm, 1875.

⁵ Vieussens, *Neurog. Univ.*, lib. i, cap. xvi.

however, as has been shown by experiments, the lymph withdrawn from the brain does not come out through the nose in such quantities as in animals, but it is best withdrawn by means of lumbar puncture. The normal secretion of the nose contains some lymph, although not much, but it is probable that not inconsiderable quantities of lymph may be removed through the nose when the secretion from the nose is very abundant and it thus becomes possible to attribute the disappearance of headache after profuse nasal discharge not only to the diversion of blood from circulation in the brain, but, also of lymph. That headaches of great severity may be made to disappear by nasal discharge is evident from observation of persons suffering from cerebral tumors. If in such patients a nasal discharge sets in (this can be produced by administering large doses of iodine), the headaches, no matter how severe they may be, usually disappear. When, however, the discharge ceases, headaches will after awhile reappear. Frequently reported cases of brain-tumors and meningitis, in which improvement was obtained after administration of large quantities of potassium iodide, may find their explanation in the suggestions made above. Moreover, Michael Braun,⁶ the discoverer of the vibration massage of the nose, reports that he succeeded in curing various kinds of most violent headaches, as, for instance, migraine in malaria, by administration of nasal vibratory massage. Two of his cases of most violent headache in malaria were previously treated for a long time with quinine, arsenic and other remedies without the slightest favorable result, and only the nasal massage treatment made them disappear. The result can only be explained by the favorable influence exercised by massage upon the blood circulation in the nose and the nasal discharge which is caused by it. The three methods of treatment of headaches by acting upon the nose, namely, (1) my method of direct irritation of the nasal mucous membrane by chemical means; (2) the internal treatment with potassium iodide, and (3) Braun's treatment

⁶ M. Braun, Deutscher Naturforscher Kongress, Aachen, 1900.

with nasal massage, can all act only through the same agency, namely, by improving the blood- and lymph- circulation in the nose. The result is an increased influx of blood toward the nose from above, namely, from the venous network of the nose. An incitement of nasal secretion takes place with escaping of blood and lymph fluid, which is withdrawn from the circulation in the brain. Owing to this discharge, the pressure in the brain disappears and the headaches cease. This may probably throw some light upon the etiology and nature of headaches, and based upon the suggestion made above we may attribute the origin of headache in many cases to the increase of pressure in the brain in consequence of disturbances of blood- and lymph- circulation. The disappearance of headache after nasal treatment may be explained by the produced relief of the brain pressure through draining off the blood- and lymph- circulation toward the nose. The action upon the nose causes an increase of blood-flow toward it; this increased quantity of blood is taken away from the upper venous plexus, that is, from the plexus of the brain-membranes, and conducted to the lower plexus, to that of the nose. Headaches may frequently be caused by the disturbance of the equilibrium between those two plexuses.

For the correctness of this view speaks the fact that just as headaches may arise through disturbances of the blood-circulation in the upper plexus, for instance, in congestive hyperemia, and then cease when the path downward becomes open through nasal bleeding, so it can, on the other hand, be produced by disturbances in the circulation in the lower plexus,—in that of the nose. This we see clearly proved by the frequency of headaches in protracted hypertrophic processes of the nasal mucous membrane, in dryness of the nose, in stagnation and retention of the nasal secretions, and in the highest degree in obstruction of the nasal openings. The most severe headaches undoubtedly arise when it becomes necessary after operations to introduce a tampon into the nose and leave it there for some length of time.

Headaches are therefore caused by two main factors: (1) Disturbance of the blood- and lymph- circulation in the region of the brain, in the dura and pia mater. (2) Disturbances of the blood- and lymph- circulation in the nose, which arrests the normal secretory functions of the nasal mucous membranes.

The nose is somewhat of an unloading organ for the brain, as it were. Hyrtl⁷ called it the respiratory cavity for the brain, and it would probably not be inappropriate, if, after all that has been said, we should consider it also a circulatory cavity. All the above suggestions answer the original question in regard to the object of the presence of such a huge venous plexus in the nose. We should consider it as a safety-valve which is designed to prevent the blood circulation in the brain from becoming too much overtaxed. In congestive hyperemia of the brain it may happen that the blood streams toward the nose and the latter becomes swollen. This we can observe, for instance, after excessive use of alcohol, and this may also explain the cases of nervous colds in the head as well as the swelling of the nasal mucous membrane in cases of women suffering from dysmenorrhœa and amenorrhœa. I have, moreover, for the sake of experiment, produced such a swelling of the nasal mucous membrane in myself by taking very hot baths of 35 degrees F. After remaining in such a bath over 20 minutes I was no longer able to breathe through the nose, but had to breathe through the mouth. I also had a pressure sensation in the head, a feeling of heaviness and stupidity, and was unfit to do any kind of thinking. After taking a snuff, secretion from the nose set in, and after the swelling decreased the nasal passages again became free. Simultaneously with it the heavy feeling in the head disappeared and I was able to think clearly. This rapid improvement of the thinking capacity I could attribute only to the improvement of the blood circulation in the brain which took place right after using the snuff. We have mentioned that

⁷ Hyrtl, *Lehrbuch der Anatomie des Menschen*, Wien, 1882, XVI Aufl., S. 569.

circulatory disturbances of the brain are, as a rule, also followed by disturbances of consciousness. Thus, for instance, we see in anemia of the brain a loss of consciousness, even to fainting; in blood-congestion, on the other hand, as for instance after alcohol excesses or after acute diseases associated with fever, we may observe not only the setting in of violent headaches, but also delirium. After a profuse nasal bleeding, however, the delirium ceases and consciousness returns. Similarly we observed that in old men suffering from sclerosis of the brain-vessels and complaining of pressure and heavy feeling in the head and inability to think clearly, this condition soon disappears when spontaneous nose-bleeding or cold in the head with profuse discharge takes place. The patients feel lighter in the head and think more clearly. It would indeed be very desirable if this spontaneous indication of nature were followed up and, in treating such patients, the draining of blood and lymph through the nose were made use of. Moreover, we are also able, as mentioned, to cause profuse nasal secretions by administering potassium iodide. This leads us also to the conclusion that the cold in the head following the partaking of potassium iodide is only a salutary manifestation, which should not be combated as some irrationally thinking physicians do.

That we are able to improve the capacity for thinking by acting upon the nose is also illustrated by the experience that in case of stupefaction of the brain, as for instance in coma, we are able to restore the consciousness, even if it is only for a short time, by administering such strong-smelling substances as ammonia and ether. This is undoubtedly connected with the inciting influence which these smelling substances have upon the blood- and lymph- circulation in the nose, and farther on in the brain. Possibly we could obtain still better results in such conditions, and maybe also in some forms of psychosis, by blood detraction from the nose, or by causing profuse nasal discharge. Dr. Sano has informed me that in three cases of maniacal exaltation he actually obtained improvement with this treatment

which I had recommended several months previously. He administered every time some veratrine to cause sneezing. The improvement of the thinking power by acting through the nose is therefore produced by the same therapeutic agency which also cured the headache, namely, through improvement of the circulation of the brain. Just as disorders of thinking ability may be improved by improving the blood- and lymph- circulation in the nose, so such disorders can also be produced artificially by making the circulatory conditions worse. This becomes most evident when, after operations, the nose, as mentioned above, is stopped up by the tampons, and, after an hour or two, a total inability to think ensues. The same may be observed in a slighter degree in every case of cold in the head. One is unable to think, nay, hardly fit to do so; at any rate, clear thinking is difficult. Similar conditions exist in hypertrophic processes of long-standing in the nose. In children suffering from adenoids similar conditions have been observed by the Danish authors who first described this affection. Such children grasp everything with more difficulty, and the expression of their faces has the sign of stupidity. Also, in adults affected that way, Guye described an inability to think. They could not concentrate their attention upon one subject, which was particularly noticeable in the study of mathematics. Mathematics is really that study which requires the greatest acuteness of mind. It is, at any rate, significant that Guye⁸ succeeded in relieving this condition, which he named *aprosexia nasalis*, by treating the nose and removing the adenoids, and so improved the thinking faculty of his patients, mostly high-school pupils, to such an extent that they made better progress in mathematics. Kafeman⁹ also found a reduction of the mentality in subjects suffering from diseased narrowness of the respiratory passages in the nose, as long as obstructions existed. That even mental diseases may originate from the presence of ade-

⁸ Guye, Kongress Deutscher Naturforscher und Aerzte, 1887 und 1888.

⁹ Nach Zarniko zitiert.

noid vegetations is known; such cases I have seen frequently in insane asylums.

That by use of snuffing powder which causes sneezing, the thinking becomes more acute is anyhow the popular belief, and it is probably not only a blind coincidence that just at the time when the greatest thinkers have lived in Germany and France the snuffing habit was in vogue; at least this is reported to have been the habit of such great minds as Kant, Voltaire, Napoleon, Frederick the Great, and others.

In view of the facts described above it would probably be advisable to use the nose as a relief organ for the brain in congestive conditions of the latter, as I have already suggested in my communications in the *Münch. med. Wochenschrift* (8th Oct., 1912). In draining off the blood through the nose by scarification of the nasal blood-vessels, or, also, by using snuffing remedies containing veratrine in small quantities, or more harmless soap-bark or thymol, we are able to drain off blood and lymph by profuse nasal discharge, which may be of great benefit in some diseases of the brain and brain-membranes. But this could also be used with success in cases of more serious mental diseases, such as maniacal exaltations or simple confusion due to too great fullness of the brain-vessels. Also in cases of some brain-tumors, in optic neuritis, in diseases of the optic nerve, as well as inner organs of vision in general, such drainage may be effective. At any rate, all mentioned above makes very clear the great significance of that small but so frequently neglected organ, the nose. The latter, indeed, stands in very intimate relation with and exercises, as we have seen, an enormous influence upon that other most precious organ, by the structure of which alone man differs from an animal,—upon the brain. The nose is somewhat of a protecting organ for the brain.

CHAPTER IV.

THE INFLUENCE OF METABOLISM UPON THE FACULTY OF THINKING.

It has long been assumed that the process of metabolism exerts a powerful influence upon the central nervous system. Its influence upon the mental condition is known, and is very distinctly noticeable in diabetes and obesity. Even such mental diseases as melancholia, and other mental disorders as well, may not rarely be caused by disturbances of metabolism.

Everything which disturbs metabolism may also influence the sphere of thinking. So we find obesity in many instances associated with a phlegmatic mentality. Upon most variable stimuli which act upon the nervous system, the latter reacts slowly, thinking is retarded and manifests itself in hesitating speech, questions are answered only after a pause, without those answers being made more intelligently or more acute. In many such cases there is a true mental laziness. This should not surprise us when we remember that a condition of weakness of the thyroid (hypothyroidia) is frequently present. These cases I have designated in my older contributions as *endogenic obesity*. It is not caused by excessive eating; frequently persons so affected, particularly women in whom such conditions occur, eat very little; as a rule, even too little.¹ The speech is entirely different in persons suffering from the opposite condition,—the overactivity of the thyroid in Basedow's disease. Here it is precipitated, actually overflowing. Similar conditions we may also observe in hysteria, where, in addition to changes in the ovaries, the activity of the thyroid may be frequently increased. Basedow's disease is also considered as a disease of metabolism, because the latter is generally changed, namely, increased. Here

¹ Lorand, Old Age.

also there is frequently present a derangement of the normal thinking power, which may not rarely develop into a mental disease.

In close connection with Basedow's disease is diabetes, in which, according to my investigations, an increased activity of the thyroid, as is now generally confirmed, plays an important rôle. It is very interesting that, as I particularly pointed out,² diabetes most frequently occurs among the more intelligent class, as, for instance, among physicians, diplomats, statesmen, etc., where exciting mental activity offers the most frequent contributing cause. The great majority of diabetics are nervous, as I have observed in many hundreds of patients during my nineteen years of practice in Carlsbad. I observed them during the season daily, and in many of them I noticed all along a high degree of intelligence. It is true, they were mostly cases of mild character, in which the sugar in the urine soon disappeared after proper diet, and in which acetone and acetic acid had not appeared as yet. In cases where the latter made their appearance, therefore in grave cases, I could observe, as a rule, a lowering of thinking power, a real apathy toward thinking. Such individuals have great difficulty in noticing some things and impressing them in their memory. As soon as a case of mild character became a grave one and acetone and acetic acid had appeared in the urine, I was able to find a lowering of thinking ability, and this I was able to observe in individuals who, one or two years previously, during the existence of the mild form of the disease, manifested high intelligence. For an explanation of this I would like to call attention to the fact that individuals suffering from the grave form of diabetes manifest a number of symptoms of weakness of the thyroid, similar to myxedema, as I have pointed out already in a number of my publications and in my books on diabetes. In cases where I succeeded by thyroid treatment in removing the acetonuria, the

² Lorand, *Die rationelle Behandlung der Zuckerkrankheit*, II Aufl. Berlin, 1909.

intelligence improved very markedly, apathy disappeared, and the patients became mentally brighter and quicker.

It would probably help to a better understanding when I point out here that I attribute the transition of the mild form into the grave one to the exhaustion of the thyroid after a preceding overactivity of it. In milder forms of diabetes the activity of the thyroid is increased and frequently associated with great nervousness and very lively thinking power. In grave cases the former is diminished and is associated with apathy and more retarded thinking, decrease of memory for recent occurrences and lack of initiative. Such patients are frequently helpless in their form of thinking, and, due to the absence of will-power, everything has to be done for them. Everyone who has an opportunity to observe many grave cases of diabetes will agree with me in this respect.

Furthermore, the occurrence of mental diseases in diabetes is not rare, and frequently they occur also in families of diabetics and in their offspring. Children of diabetics are frequently very nervous, but at the same time very intelligent, as I pointed out ten years ago.³

Savage⁴ calls attention to a remarkable interrelation between diabetes and mental diseases. When a mental disease becomes manifest the sugar content in the urine is reduced, and it increases with the improvement of the mental disease. He observed a case of this kind in a woman with melancholia. Similar observations have also been made in gout, particularly by the great investigator of the gout—Garrod. He observed frequently an improvement of the melancholia during an attack of gout, but when the attack of gout subsided, after using various antigout remedies, violent mental symptoms set in.

A much more important rôle than that of sugar as an etiological factor in origin of mental diseases is attributed (particularly by English authors) to uric acid. The presence of

³ Lorand, *The Practitioner*, London, 1903.

⁴ Savage, Address on Mental Disorders, *Lancet*, 1912.

large quantities of uric acid in the blood exercises, according to Haig,⁵ a very unfavorable influence upon the emotions and spirit. That a feeling of depression in such a condition, with influence upon the thinking ability, may easily occur, we can generally agree. In migraine there also exists, as a rule, an entire inability to think. According to many authorities this condition originated on the basis of uric acid diathesis. So much is certain that during an attack of migraine large quantities of uric acid are found in the urine, but also much phosphorus. Phosphorus and lime, which are contained, as very important elements in all our nerve-cells, are eliminated frequently in large quantities in various diseases of metabolism, as, for instance, in diabetes, Basedow's disease and acromegalia. The disturbance of thinking ability, then, which very frequently occurs in such diseases, may be attributed, in addition to the changes of the ductless glands, also to lime and phosphorus metabolism.

⁵ A. Haig, *Uric Acid in Causation of Disease*, London, 6th edition, 1903.

CHAPTER V.

THE INFLUENCE OF LIME AND PHOSPHORUS METABOLISM UPON THE FACULTY OF THINKING AND THE ORIGIN OF MENTAL DISEASES.

REPORTS have been made, many years ago, that fractures are a frequent occurrence among the insane. In most instances this was attributed to supposed brutal treatment by inhuman attendants. From the investigations made in later years, however, it seems probable that in such cases it was a matter not so much of actions of brutal attendants as of an abnormal fragility of the bones of some insane. They break off on the slightest provocation, and at post-mortem examinations they can be cut with a knife almost like paper. Apparently we have here a condition which has been observed, up to the present, mostly in pregnant women, namely, a softening of the bones, or osteomalacia. Now, as it is very clearly seen from a large and thorough treatise by the Dutch physician Scheer,¹ this morbid condition is not at all a rare occurrence in the insane. What characterizes osteomalacia is the fact that the bones are very poor in lime-salts. The latter, and the phosphorus as well, are eliminated in large quantities. To positively exclude mistaking this condition for osteoporosis, a condition observed in bones of old people, the bones must be röntgenized. When Röntgen rays pass through a normal bone, there appears an opaque shadow. The more lime a bone contains the denser will be the shadow; the less of lime there is in it the more transparent will the bone be. Such a light shadow we find in conditions where the bones are poor in lime-salts, as, for instance, in tuberculosis. I would consider it a proper procedure that the skeleton of all scrofulous children and children of tuberculous parents should be röntgenized—in order to get an idea in regard to their pre-

¹ Von d. Scheer, *Osteomalacie en Psychose*. Amsterdam, 1912.

disposition to tuberculosis. At any rate, such a slight shadow as here mentioned will frequently be found.

When bones of individuals suffering from osteomalacia are röntgenized, no shadow at all is obtained, because, on account of their being poor in lime-salts, the Röntgen rays pass through entirely.

Von d. Scheer has observed in two years and a half ten very typical and circumscribed cases of osteomalacia. In most of them the diagnosis was also confirmed by Röntgen pictures and post-mortem examinations.

Undoubtedly, however, this disease, in a milder degree, occurs much more frequently, but the recognition of it is much more difficult, because many of the insane patients are sitting all day brooding by themselves, and when they happen to suffer great pain they complain to the attendants and accuse them of being the cause.

From a foregoing statement we learn that in some cases of mental disturbance much lime and phosphorus is eliminated by the body. We know, moreover, that both substances are frequently eliminated from the body in large quantities in various disturbances of the nervous system, as, for instance, in hysteria and neurasthenia, and in Basedow's disease. But in these conditions very frequently exist disturbances of free thinking ability, such as abnormal exaltations, absent-mindedness, inability to concentrate attention, abnormal forgetfulness, a number of phenomena which, in their highest degree, are usually observed in mental diseases. This correlation cannot surprise us when we remember that lime and phosphorus are very important constituent parts of the nerve-cells. These substances are indispensable for the normal structure of the latter, therefore are necessary for those highly important cells which constitute the layers of the brain-cortex, the seat of the intellectual faculties. It has been proven in ether extracts that the gray substance of which the brain-cortex consists contains more phosphorus than does the white substance.

Petrowsky also found twice as much lecithin in the former as in the latter. A very interesting discovery of Marie leads us to the conclusion that in idiocy and dementia præcox, which is the most common of all mental diseases, the brain contains less phosphorus.

In osteomalacia, as we have seen above, disturbance of mental faculties frequently occurs. If our assumption is correct, this condition should be improved after administration of phosphorus. This is actually the case, and also the lime metabolism is favorably influenced by it. Similar improvement by treatment with phosphorus was obtained in rickets.

Of great importance are the experiments of Förster,² who kept dogs on a diet from which all nutritive salts had been removed except phosphorus and lime.

The result was that they all became stupid, and lost all their intellectual faculties. That the introduction of phosphorus exercises a favorable influence upon the nerve functions may already be concluded from the frequent therapeutic administration of the lecithins. By administration of phosphorus favorable results have been obtained in Basedow's disease (Kocher,³ Trachewsky), and sometimes also in epilepsy.

Phosphorus can be very profitably administered by means of nourishment containing lecithin in abundance. The so important lecithins, which are indispensable for the normal function of the central nervous system, contain phosphorus as their most important constituent part.

According to Slowzoff,⁴ the lecithins influence favorably a more profitable utilization of phosphorus introduced with the food. If such important constituent parts of the nerve-cells as phosphorus and lime are eliminated in large quantities, then, as a rule, disturbances of the nervous function and thinking

² Förster, Mitt. der morphol.-physiol. Geseilschaft uz München, 1878, Nr. 3.

³ Kocher, Mitt. aus den Grenzgebieten, Med. u. Chir., 1901, 24.

⁴ Slowzoff, Zeitschr. für physikalische und diätetische Therapie. April- und Maiheft, 1910.

faculty cannot fail to appear. This we observe very distinctly, for instance, in chronic inflammation of the prostate, but in highest degree in osteomalacia, where mental disturbances occur frequently. As, for instance, Weber⁵ found, forty years ago, that of fifteen osteomalacic pelvises in the Museum of Pathological Anatomy at Prague, six came from insane asylums. He also induced an examination of the central nervous system for the investigation of the nature of osteomalacia.

Wagner von Jaueregg⁶ has already observed in 1890 that in regions where many cases of osteomalacia are observed, mental disturbances during pregnancy and in puerperium also occur. I, myself, have observed a condition similar to melancholia in a patient with osteomalacia in the hospital in Ottawa (Can.), which was shown to me by Colleague MacArthur in the winter of 1907.

On account of its frequent occurrence during pregnancy and in puerperium the cause of bone softening has been attributed to the overactivity of the ovaries (Fehling). When in such women the ovaries were removed a cure had actually taken place. Some of the later investigators attribute the cause of osteomalacia to another ductless gland,—to the thyroid gland, and others,—to the suprarenal gland. The truth is probably the same here as in other diseases of the ductless glands, namely, that we have to deal with disturbances, not in one of the glands, but in all of them. Mostly, the thyroid participates in the process, because the latter exercises a very powerful influence upon the bone system.⁷ We know that the inactivity of this gland retards the ossification of bones; on the other hand, we know that in the reverse condition, in Basedow's disease and in diabetes, too much lime and phosphorus is eliminated. Growth in children is also much increased by administration of

⁵ Prager Vierteljahrsschrift, Bd. i, nach v. d. Scheer zitiert.

⁶ Wagner v. Jaueregg, Osteomalazie und Geistesstörungen, Jahrbuch für Psychiatrie, 1890.

⁷ Lorand, Old Age.

thyroid (Hertoghe). The thyroid helps in utilization of the lime and phosphorus which is introduced with the food. Of this fact I have convinced myself very clearly from observation of a number of patients, two cases of which I should like to mention here. In a 30-year-old manufacturer from Vienna I found an elimination of a very great quantity of phosphoric acid, namely, 4.80 gr. to the liter, in normal feeding. The patient was a neurasthenic, with symptoms of high melancholic depression, no desire for work, very bad memory, absent-mindedness, insomnia, impotence. I gave him a diet rich in phosphorus, and also two thyroid tablets daily. When I examined the urine two weeks later for phosphorus elimination, an increase of phosphorus utilization had been established, namely, 2.30 gr. to the liter. In a second case I had a 45-year-old merchant, a neurasthenic, very excitable, very absent-minded and forgetful, making mistakes very frequently in speaking, restless and constantly gesticulating. The urine showed 4.30 gr. of phosphorus to the liter. After a two weeks' treatment with a diet rich in phosphorus and one-half thyroid tablets daily, much better utilization of phosphorus could be observed, namely, 1.85 gr. to the liter. Both patients felt better at the end of the treatment, and were mentally more active. The second patient was also less excitable.

It has been proven by a number of experiments that by excessive administration of thyroid too much phosphorus and lime is eliminated. According to Silvestri and Tosatti,⁸ moderate doses of thyroidin promote the retention of lime, while large doses of the former promote a too great elimination of the latter.

A diet which is rich in lime and phosphorus may, at any rate, as we will see in the next chapter, exert a very favorable influence upon the thinking faculty.

⁸ Silvestri und Tosatti, *Gazzetta degli ospedali e delle cliniche* 1907, p. 1067.

CHAPTER VI.

THE INFLUENCE OF NOURISHMENT UPON THE INTELLIGENCE.

AMONG those tribes in the lowest state of civilization, and which are usually ranked under the common name "wild," nourishment is, as a rule, very meager, and they swallow it down greedily, like wild beasts; particularly is this the case with meat, which is rarely gotten hold of.

According to Wallis¹ the inhabitants of the islands of Tierra del Fuego devour a still struggling fish from head to tail like the sea-calf does, and tear up a whole bird raw with large bites. The Papuans do not take the trouble to properly cook or fry the large newts which they may have caught, but eat them half-raw.

Grasshoppers, larvæ and plant-roots frequently constitute the meager food for the Bushmen; when occasionally, however, an animal becomes their prey they, and this is also the case with Hottentots, eat it up half-alive, and suck off the bones. Meat constitutes a very rare article for those wild tribes, because cattle raising, which affords the proper means for meat supply, is very difficult, due to the tropical climate. For this reason even the putrified meat of dead animals is a feast for them. The Kaffirs and Bongos² of eastern Africa fight with the hawks over carcasses left by the lions. They find this meat more tender and easier to digest, and seem to experience no ill effects from such delicacies, even when, as the negroes in the interior of Africa frequently do, they celebrate real orgies with the meat of large dead animals. They are able to partake of such meat for hours until, from consuming enormous quantities of it, they get into a state of exaltation or intoxication, and as

¹ Wallis, *Universal History of Voyages*, vol. iii, p. 230.

² Schweinfurth, *Im Herzen Afrikas*, i, S. 289.

an after-effect are rendered unable to perform any kind of work for a whole day. A similar thing is observed in Australian negroes when a dead whale happens to be thrown up on their coast; they continue eating that enormous animal for days.

The intellect of these tribes, who feed themselves in such a barbaric fashion, is of the lowest and most animal kind. Darwin³ tells of a case in which a Tierra del Fuegian killed his child by striking its head against a rock, because, while playing, it had upset a basket containing mollusks.

He also said that the Tierra del Fuegians, driven by want of meat, first eat up their old women before they decide to do the same with their house-dogs. The Kaffirs, again, put up traps for lions, using their children for bait, and the cry of the latter actually attracts the lions.⁴ It cannot be assumed that they understand the enormity of such an act, for they are so stupid that when a number of them are standing in a row to urinate they would rather urinate upon one another instead of going out of the way of each other. The animal-like nature of these wild tribes is also manifested by the fact that while the mother cares for the suckling with the utmost tenderness, she is indifferent about the child when it grows up. She, therefore, acts like a cat's mother. Burton⁵ also found that the father is, similar to animals, very hostile to his son when he grows up.

The art of thinking among these wild tribes is, in general, not much above the level of the animal. It is hardly possible to find in them a single quality which would indicate any higher human intellect. Most of them, in the first place, lack the main factor for development of intelligence, in that they are not able to devote their attention to any object. When Cook came to Australia the first time on his ship *Endeavor*, he noticed particularly that the natives did not show the slightest amazement at the sight of the ship, notwithstanding that they had never seen

³ Darwin, *Voyage Around the Earth*, S. 232.

⁴ Layland, *Journal of the Ethnol. Society London*, 1860, vol. i, p. 79.

⁵ Burton, *Travel to the Great Lakes*, p. 637.

a ship before, which seemed to them a swimming structure. They came on board, but manifested no curiosity whatever about the many new things, which they had never seen in their lives. The lack of curiosity can only be attributed to the inability to pay attention, and man lacking the faculty of paying attention is, as we will see later, unfit for any intelligent work.

If speech may be considered as measuring the intelligence of a people, then the low grade of it in the wild tribes is already indicated by their poor vocabulary, which in some African languages is so limited that, in order to make themselves better understood, the natives have to add gestures to the words which they are using. Because of a meager vocabulary, some wild tribes, to express their ideas in a crude form, are compelled to use illustration, as also was the case with the primitive men, the cave-dwellers, whereas, it is well known that the English and Americans, whose language has the richest vocabulary of all people, gesticulate the least.

In the languages of the wild there are words only for concrete objects; abstract ideas which require more intelligence are unknown to them. The same with counting; they have only words to count up to five; for the number five they say "one hand," for the number ten they say "two hands." Some tribes, as the Australian, can only count to two; what is above that they express by "many." We see from this how psychologically correct the saying is: "He is so dumb that he cannot count two."

The Esquimaux are also unable to count, and, according to Crantz,⁶ are hardly able to count the fingers of one hand. They are neither able to state the time, nor are they able to tell their age. Their food is also very meager, in the sense that it lacks variety. If we glance over the population of the earth we will find, as a general rule, that wherever the food is meager, poor, or one-sided, not containing all the main groups of our food-stuffs, the respective population is found to be of a low grade

⁶ Crantz, *History of Greenland*, S. 186.

of intelligence. The lowest grade we find, however, where meat or, more correctly speaking, albumin as foodstuff is wanting. This is very natural, for the latter is simply indispensable for the building up and the proper function of the central nervous system. It is indispensable for the blood formation, because it is urgently needed for the formation of the blood-plasm and blood-corpuscles. Nourishment which is poor in albumin surely leads to anemia, and this can seriously affect the blood-supply of the brain-cortex. It has to be considered further that, with albuminous food very important chemical substances, such as lime, and particularly phosphorus, are introduced into the body for the building up of the nerve-cells and, consequently, also of the cells of the brain-cortex. With no other food are we able to incorporate into our bodies these substances in such large quantities as we are able to do with meat and fish, which are rich with nucleins; the same may be said of cheese, milk and eggs, but all these are foodstuffs which are very meagerly represented in the nourishment of wild tribes.

If we compare the intelligence of those inhabitants of Europe or elsewhere, who feed themselves mainly with meat and a sufficient quantity of vegetables in addition, with those who use only carbohydrates, we find that the former have everywhere subdued and displaced the latter. The ample meat-using Dutch have subjugated the rice-eating Javanese and Malays. The English, notwithstanding their being very small in number, have, thanks only to their higher intelligence, with only a handful of soldiers, as it were, subdued the almost exclusively rice-eating Hindoos. Millions of people have been kept in check by a small number of Europeans through their higher intelligence, just as one human individual is able to restrain and to tame a dozen wild beasts, such as lions and tigers, only because of the difference in the brain of the animal and man. The Japanese stand on higher level, but they are carbohydrate consumers only to a certain degree; in addition to rice many of

them eat fish daily, and the Japanese soldiers also receive meat rations.

The superiority of the European is not to be attributed, however, only to the mixed diet and rich food, but also to favorable climatic conditions, as we will see in the next chapter.

CHAPTER VII.

INFLUENCE OF CLIMATE, SEASONS OF THE YEAR AND WEATHER UPON THE ABILITY TO THINK AND MENTAL ACTIVITY.

WHEREVER man lives he is exposed to the influence of the elements which surround him. He is composed of these elements, because his flesh and blood, his heart, liver and kidneys, all his bones and also his brain are composed of minute particles of the same elements which compose the atmosphere surrounding him, the earth which carries and nourishes him, the water which he drinks, the air which he breathes. The sun, and the moon too possibly, exercise a powerful influence upon man. Without the coactivity of the sun, no life on earth would be possible. Where its rays reach the earth only sparingly, plants, vegetables and fruit grow only very scantily, and because animals do not find sufficient food, man is, in such regions, deprived of his most important food product, meat. The consequence is a one-sided nourishment. The same occurs, however, in such regions where the heat from the sun reaches a high degree and cattle raising becomes difficult on that account. Excessive heat has possibly a still more unfavorable influence by its directly weakening action. We know from observation how difficult it is to do any mental work during the hot summer days, and it is, therefore, a wise provision that schools are closed in such hot weather. When the air is very hot, and particularly when it is combined with humidity, thinking is very difficult, and man's actions are less under the controlling influence of reason, they lack judgment, and on hot summer days, or in the regions with an intolerably hot climate, violent acts more frequently occur. Our courts should exercise more leniency in decreeing penalty for offenses committed during these hot, sultry sum-

mer days, which exercise such an unfavorable psychological influence.

That the working ability of the white man in hot climates is very much reduced has been proven repeatedly. Not rarely this can also be clearly seen from reports sent from those regions. For instance, Colonel C. E. Woodruff, United States military surgeon in the Philippines, told me that in the reports of various committees he frequently found entirely false assumptions, entirely illogical conclusions, and frequently signs of incorrect observations in the Philippine service.

It is a very significant fact in this connection that such hot regions have hardly given a single genius to mankind. All over the natives there are of the lowest grade of culture; they are wild.

Just about as unfavorable is the influence of extreme cold, which keeps civilization on a very low level in the Polar regions. The absence of the sun in the northern regions throughout the greater part of the year and the often covered sky in the northern lands have a very depressing influence upon the emotions, and consequently also upon thinking. In the extreme north the man is silent, more considerate of what he says—more meditative. His thinking is more under control of strong judgment. How different to this is the word-flow of the southerner! The smallest sensation produces in him a comparatively strong reaction, an excessive exaltation, and this may naturally facilitate the production of imaginary presentations and phantasies.

Just as the North cultivates the gift of criticism, so the South cultivates more the power of imagination, and the latter is actually the real home of art and music.

What characterizes genius is originality combined with criticism. Originality, on the other hand, without strong power of imagination, is an impossibility. When, therefore, the North is characterized by criticism and the South by originality, the temperate climate is characterized by both. In the northern part

of the temperate zone criticism will predominate; in the southern part originality is prevalent.

Under the temperate zones we do not mean the geographical position, but we have in view the climatic conditions, and, therefore, Scotland, the most densely populated part of Scandinavia, the greater part of Russia and Italy belong to that temperate zone. The largest number of men of genius, that is to say, men who combine original ideas with much imagination and much of the critical faculty, have, in relation to the size of population, been produced in the warmest sections of this zone, in Italy and England.

In the colder sections of this zone, for instance in Germany, the critical predisposition predominates to a very great extent, and we actually find here the greatest number of exact scientists. *Germany is the fatherland of the cold, critical mind*; there, under the influence of the great, probably too great, criticism, originality is surely more restrained than in any other country of the world. Whether to all questions in so short a span of human life a too strong criticism and too great a dose of skepticism is well applied should be worth while discussing. If the German race is characterized by too much criticism, the Roman by too much phantasia, then the Anglo-Saxon race, which originates from the two, possesses both qualities in a high degree, and to this may be attributed its high intelligence.

Of a number of prominent geniuses it is reported that they could work only during beautiful weather or only in warm temperatures. So, for instance, the working rooms of Voltaire, Buffon, and Kant had to be heated even during the summer; Napoleon had also his room heated even in July. Schiller wrote to Goethe in May, 1799, that he hoped to work again as soon as the nice weather sets in. In November he wrote him that in these doleful days with heavy skies he feels no desire at all to work; in December, again, that in this gloomy weather it is almost impossible for him to think clearly. On the contrary, in July, 1818, he mentions that, thanks to the beautiful weather, he

feels better and feels the poetical inspiration coming. In December of the same year he regrets that the finishing of the "Wallenstein" has to be done in just such a time of the year when it is difficult for him to keep his mind clear. Kant also was particularly sensitive toward influences of the weather, and the first question which he usually directed to his visitors was about that subject.

Most mental workers would be able to confirm it from their own experience; under the influence of extreme temperature, either too great heat or too great cold, they are less fit to think, and feel no desire for mental work. I know myself that in nice, sunny weather I feel more pleasure in mental work. Of all seasons of the year the beautiful spring is the most favorable time; it is the time when activity dominates everywhere in nature, and all instincts are stimulated. The mind is also favorably stimulated in spring.

The cold weather of the winter, on the contrary, acts rather depressingly. So we find Milton,¹ in one of his letters of 1678, stating that the cold of the winter puts great obstacles in the way of free development of his imagination, and that he works best in the spring.

That mental activity is most stimulated in warm spring days follows clearly from the statistical investigation made by Lombroso. He found that most of the creations of art and literature, as well as most discoveries in physics, chemistry and mathematics, have been made in the spring; the fall stands next, then comes the summer, and last of all is the winter. A very interesting proof was advanced by Lombroso, namely, that three great medical investigators, Spalanzani, Malpighi, and Galvani, made their discoveries in the spring months. Lombroso attributes great influence upon mental forces to warm temperature, sunshine, and particularly to sunny high altitudes. According to him, the greatest thinkers, the men of most high intellect, come from sunny, high, mountainous regions, where

¹ Dr. Johnson, *The Life of Milton*, London, 1809.

men are also of great stature. The explanation for this is, that in these regions the air is the purest and exerts an exciting and ozonizing influence, the blood becomes well oxidized, and this is necessary for brain-work. My explanation for this phenomenon is a different one. I would like to call attention to the great influence of sun-rays and heat upon the activity of the thyroid gland, which manifests itself in an increase of functions which are under its control, such as blood-formation, blood-circulation, growth, lime- and phosphorus- metabolism. Of course, Lombroso² could not take this fact into consideration, because at the time when he wrote his book very little work had been done in this direction. Very little also was known at that time about the influence of the thyroid gland upon bodily and mental growth.

² Lombroso, *L'homme de genie*, IV Auflage, Paris, 1900, S. 190.

CHAPTER VIII.

INFLUENCE OF HEREDITY UPON THE ABILITY OF THINKING.

IF parents manifest some anomaly in normal thinking, something similar may be found very frequently in their children. This applies also to the more serious disturbances of thinking power—the mental diseases. The predisposition to it is inherited. As a rule, these disturbances become manifest in the children at an earlier age than in the parents. According to the investigations of a very competent investigator, Mott, the influence of heredity becomes particularly noticeable in the juvenile period; when the children have attained a certain age the probability of inheritance is diminished, and continues to decrease with age.

The critical period which is to be mostly watched is puberty. Even normal children, particularly girls, are at that period in a condition of excitation, on account of an increased activity of the sexual glands. At the same time changes in the thyroid gland take place, and as these glands, as we learned in Chapter I and II, exercise a certain regulatory influence upon the normal thinking ability, changes in the latter may be produced in consequence. This condition may become very dangerous if the offspring inherit changes in the ductless glands from their parents. At the German Congress for Internal Medicine¹ I have proved that the ductless glands take part in inheritance. If parents manifest changes in the ductless glands, the same will be noticed in the children. I have also mentioned the case of Osterreicher, in which Basedow's disease was inherited by eight brothers and sisters; also the experiments of Lanz,² who found that when goats had their thyroid

¹ Lorand, *Verhandlungen des Deutschen Kongresses für innere Medizin*, 1905. Diskussion über Vererbung.

² Lanz, *Archiv für klin. Chirurgie*, 1905.

removed their offspring manifested symptoms of myxedema and remained decidedly backward in their growth. Particularly instructive is the case reported by Lanz, in which an otherwise healthy mother had two children with normal thyroids, but when at the age of 40 she acquired a goiter the child which was born afterward also had a goiter. Acromegalia also frequently originates as inheritance (Schwoner, Bonardi), and it is worthy of mention that the heritage from the mother is much more frequently found in the daughters than in the sons, as shown by Mott.³

If, therefore, mental disturbances are so frequently inherited, the blame must, in many instances, be attributed to those factors which are frequently the underlying causes of mental diseases, and these are changes in the ductless glands. This is also proven by the fact that all those agencies which exert an unfavorable influence upon the ductless glands, particularly upon the thyroid, also encourage hereditary tendencies. This is well established, for example, in alcoholism, syphilis, sexual excesses, multiple pregnancies, and most particularly in mental excitements. The latter is probably also the underlying cause for the harm done by the too great demand made upon the mentality of the pupils in the grammar schools.

I should like to report here a case out of my own experience. It was that of a young Canadian girl from a good family, who took up the profession of nursing. It may be mentioned here that in Canada and in the United States the nurses come very often from fashionable families, and always have a good education. This girl afterward took up the study of medicine, but the preparation for passing the examination for the doctor's degree were fatal for her. She became insane, which was partially due to the influence of inheritance. If great caution in regard to heredity is required in boys, it is still more so with respect to girls, because in the latter the physiological changes in the sexual glands are of still greater importance.

³ Mott, *Brain*, 1911, 39, S. 73.

Inheritance of mental diseases is particularly favored by intermarriage. To this may also be attributed the frequency of mental diseases among the Jews. According to Lombroso⁴ the frequency is six times greater among the latter than among other denominations. Statistics taken on December 1, 1880, in Prussia, have shown thirty insane Jews to twenty-four Lutherans and twenty-three Catholics. Based upon his experience in Colney Hatch Asylum, Mott points out the frequency of inherited mental diseases among Jews. On the other hand, again, we find among Jews, according to Lombroso and Jacobs, surprisingly often, many mental faculties highly developed, as, for instance, in the domain of music, literature, medicine and languages; particularly, however, in the sciences and in finance, Lombroso has pointed out their creative, initiative ability.

The influence of interbreeding is particularly pronounced among the Polish Jews, among whom neurasthenia and hysteria very frequently occur. The same is also noticeable among races inhabiting secluded localities, such as the Shetland Islands or in mountain inhabitants of Bosnia (Kobler).⁵ I should like to raise the question here, whether the frequency of idiocy in the deep valleys is not due, in addition to absence of sunshine and the influence of the water, also to lack of communication with the outside world, which favors intermarriages. In the interest of the development of mankind it would be very desirable that marriages between subjects of various nationalities and various classes of population should take place more often.

If we admit that mental inferiority is, as a rule, transmissible by inheritance, so that it is desirable to make marriage of the insane impossible by law, we must also admit that superior mental faculties may also be transmitted to the offspring. If degeneration of the ductless glands is undoubtedly transmitted, we must assume the same for the good qualities of those glands.

⁴ Lombroso, *l. c.*

⁵ Kobler, Verhandlungen des Internat. Medizinischen Kongresses, Madrid, 1902. Neurologische Sektion.

And, in fact, we see it, for instance, in the case where the high stature of the father or of the mother, or still more of both, is transmitted to the offspring. This would, however, be impossible if the thyroid, the parathyroid, or the sexual glands were not in good condition, because all these glands influence the growth of the skeleton. The growth of the extremities and of the skull is influenced by these glands and by the hypophysis, and, therefore, we see the children resemble their parents in form of the skull and face. This is even noticeable in minute details; for example, in the inherited drooping lower lip of the Hapsburgs and the large, prominent nose among the Bourbons. The transmission of the good qualities of the ductless glands, particularly of the thyroid gland, is not limited, however, only to the physical side of the body, but also to the mental. That the capabilities of the parents may be transmitted to the children we know from the works of Galton.

According to Galton's law, the characteristics of the children are inherited from the parents in 50 per cent. of cases; from grandparents in 25 per cent., and from the great-grandparents $12\frac{1}{2}$, and only recently Peters⁶ was able to confirm the correctness of this law with regard to mental faculties. He found that when parents were intelligent and have shown marked ability in school, the same could be observed in their children and grandchildren. Experience, moreover, shows that mental faculties of any kind may be inherited in the same family. This is clearly shown in families in which a preference for music exists. The transmission of this predisposition we see strikingly often. Children of professional musicians are very often born musicians, as was, for instance, the case with Beethoven, Mozart, Haydn, and particularly with Bach. In the family of the latter music was cultivated for hundreds of years back. In the seventeenth century there lived one Müller Bach, the progenitor of the family in Freiburg, who was known as an ardent devotee of music, and up to the present day the prefer-

⁶ Peters, *Kongress für Psychologie*, Berlin, 1912.

ence for music lives in that family. Among the offspring of the distinguished Jacques Bernouille most of them were excellent mathematicians. Charles Darwin's son was also a celebrated naturalist.

As a brilliant example of inheritance of genial faculties I would like to mention the Herschells, father and son. Herschell's father was oboeist in the Guard at Hanover. At the age of 19 he entered military service as a musician, and was sent to London. He was an excellent musician, and being a well-appreciated member of the Octagon Chapel, he gave lessons which were well paid for. Through studying Smith's "Science of Harmony" he began to read books about optics, and this awakened his interest for astronomy. He remained awake many a night to study the stars from the roof of his home. With the money earned by giving lessons he constructed a telescope and made observations aided by his distinguished sister Caroline. Herschell made many discoveries in the domain of astronomy, and later became one of the greatest astronomers of the world. I mention the details of his life because they show traits characteristic of genius, of which we will speak later. Herschell married at the age of 50, and at the age of 52 he became the father of a son, who also became a genius in the domain of chemical photography. Independently of Talbot, he discovered photography and was first to prepare positive and negative films. He was also a great astronomer, and manifested, while only a boy, gifts as a mathematician, having presented contributions in mathematics before the Royal Scientific Society at Cambridge. Both father and son were scientists of great originality; their work was of the creative, initiative kind; they were both discoverers.

The interesting point in this, so rare example of a son of a genius also becoming a genius, is that the father was 52 years old when the son was born. There are other examples which indicate that geniuses are begotten by older men. Children begotten at a greater age, however, as between 80 and 90, are,

as I have shown in my book "Old Age," in most instances idiots.

In the art of painting these inheritances also frequently exist. This is clearly illustrated in the Tizian family. I can also mention an instructive example of inherited talent for painting out of my own experience. I know two sons of a world-famous Vienna painter, who, among others, painted the portraits of the parents of the Emperor William II. and Queen Victoria of England. The younger boy, a godson of Empress Victoria, drew for me, at the age of 10, all kinds of objects from life, which were true to nature. He at that time did not have any instruction whatsoever; therefore the presence of an inherited faculty no one could deny. The second son became later a very famous artist in Munich.

The inheritance by the son from the father is not so frequent; in fact, we see more often that sons look like the mother and also inherit the mother's faculties. Not infrequently it happens that talent, while inherited from the father, is discovered and developed by the mother. We are more under obligation to our mother than to our father. She spends all of her time with the child and watches its development. The mother is the best and most natural educator of the child. It is the mothers who bring up the greatest men. Napoleon always said that for everything he had to thank his mother.

Geniuses have not always, however, been particularly careful in selecting their wives. Matrimonial happiness was not always found in their homes. They were able to impress everybody except their own wives. Socrates had his Xantippe, and Napoleon, while he was a great man before the whole world, was, in the eyes of his Marie Louise, not so great as the well-built Count Neipperg, whom she married after the fall of Napoleon. It is possibly due to this influence of matrimonial unhappiness that marriages of geniuses remain childless. It seems as if sterility is almost a characteristic of a genius. Nature is very economical with her precious gifts. She makes

the glittering gold and diamonds originate in places where man can find them only with difficulty and after hard labor. Everything which man longs for she makes rare; beauty and high intelligence are rare faculties, and among many, many thousands of brains there is only one in which the divine spark of genius shines. It is as if nature's potency in creating a genius becomes exhausted and cannot act to the same degree in the generations following. The son of the divine Mozart, Franz Xavier Mozart, inherited nothing from his father's ingenuity. If we glance over his compositions we find nothing original in them, of the creative; of the inspiration which characterized his distinguished father, there are no traces to be found. But we can, indeed, not expect any inspiration from anyone who, as he used to say himself, liked a good supper better than the best music, and to whom the sound of gold coins jingling in his pocket was the best music. Rembrandt's son manifested nothing in his pictures of that wonderful tone which characterized those of his father, notwithstanding that the latter took much pains with him. Titus Rembrandt, the illegitimate son of the famous Rembrandt and Hendrickje de Taghers, who was his servant-girl, became only a very little known, mediocre artist.

Oliver Cromwell's son Richard was entirely unfit for the high office which he occupied, and he himself resigned from it. It seems really that very frequently the father's fame becomes a malediction to the son, and the good fortune of the former becomes misfortune to the latter. The rich table which he finds set before him when entering the world satisfies his appetite very soon. Just as salt and pepper is needed for the table, so are poverty and deprivation the best spices to stimulate ambition and increase diligence; they are the best teachers.

CHAPTER IX.

THE INFLUENCE OF AGE UPON THE INTELLIGENCE.

WE have learned that the ability to think is very much influenced by the blood-circulation in the brain-cortex. If during advanced age an increase of the connective tissue in the blood-vessels of the brain-cortex takes place, blood-circulation in that region becomes impaired and this would naturally cause disturbances of the thinking power.

This fact can easily be observed when carrying on a somewhat extended conversation with an old man. You will notice sometimes that during the conversation he will come to a stand-still because he cannot recollect most important occurrences, and particularly personal names. He may also begin a new sentence before he has finished the previous one, or jump from one subject to another. His talk, therefore, becomes purposeless. Often he forgets the subject of the sentence before he finishes it.

That which characterizes the intelligence of an old man mainly is a weak memory; he cannot incorporate anything into his memory. We can explain it very easily if we take into consideration the fact that to memorize something we must concentrate our attention on the subject. The latter, however, requires deep thinking, which is only possible when the blood-supply to the brain is sufficient, but this is here made more difficult on account of the arteriosclerotic changes in the blood-vessels of the brain.

Old people remember much more distinctly, however, things which have occurred when they were young; during a time, therefore, when the blood-circulation in their brain-cortex was still very lively and their thyroid gland quite active. In view of the fact that memory is the necessary foundation for acquisition of new experience and knowledge, and that without it learning is entirely impossible, old people can learn anything

new only with difficulty. Owing to deficiencies in the organs of sense, exact perception and fixation of new ideas and impressions into the memory become difficult.

In giving a decision or in expressing an opinion we are guided by our experience in the past as well as that of recent occurrence. In old people recent experience is, however, very meager and incomplete; their judgment is, therefore, often narrow, and almost always conservative; not very easily affected by innovation, just because they do not easily acquire any new experience and knowledge. Imagination, imitativeness and original thoughts are only very rarely found among the old. Much more often do we find these faculties among the young. The young have a more rapid and more extensive blood-circulation and are more easily inspired by new ideas. The youth becomes intoxicated much more easily than the old man, not only metaphorically, but also literally. An old person can sometimes stand large quantities of alcohol without becoming intoxicated—such a case I observed quite recently in a single lady 82 years old—because in such a case a very great blood congestion to the brain-cortex undoubtedly plays a great rôle, and this does not take place in old people very easily.

Notwithstanding the above-mentioned impaired thinking ability of an old man, he has an enormous advantage over the young; he has gathered in the course of his long life an enormous amount of facts and experience, and can always recall them when it becomes necessary to make comparisons for the purpose of drawing conclusions and forming an opinion. The more he is able to draw upon similar facts and experience gained, the more keen, more careful and the wiser will his judgment be. The latter will be wise, and will be the wisdom which should mark the judgment of a mentally healthy old man. While there are very many old men who suffer from arteriosclerosis of the brain, who have no memory at all, and are unable to observe anything, and while most old men never or only rarely have original ideas, we find, on the other hand, old

people with well-preserved blood-vessels and a still active thyroid, who are in possession of an admirable intellect, fresh memory, original thoughts and enormous experience. To this kind of men did Gladstone belong, who was honored as the wise man of the nation. Sallust was perfectly justified in saying, "Melius in senibus ratio et iudicium est!"

It is known, moreover, of a number of genial men that they have produced mental creations of highest degree and originality even at very advanced old age. We know that arteriosclerosis does not necessarily involve all blood-vessels, and not every old man must necessarily suffer from arteriosclerosis. An old man, therefore, who preserves his health, whose brain vessels do not show as yet much of arteriosclerosis and who, besides his power of criticism acquired throughout his long life, also has good organs of sense, and is able to grasp good ideas, will always stand higher mentally than a young man. Whenever the well-supplied-with-blood brain of the young might lead them into the realm of excessive imagination, and ideas threaten to cut loose from the sphere of reality, such an old man could benefit them with good advice which is based upon his rich experience. *It is the duty of the aged to restrain the fire of the young.* The old are often our best counsellors; they can teach us very much. How much truth is in the French saying: "Les vieux singes apprennent au jeunes à faire des grimaces."

I learned very much from an aged Carlsbad colleague, the all-respected Dr. Gallus von Hochberger, when I took him once to a patient, fourteen years ago, for a consultation. The patient, the old Count J. N., from Budapest, was 83 years old, the consultant 96 years. Notwithstanding this old age, the mind of the old man was very fresh. I learned from him a lot of useful hints, such as cannot be found in any textbook. Textbooks are generally full of scientific material, but contain nothing of the simplest things, such as are required in every-day life. The practice which was in vogue a hundred years ago, that young

physicians became apprentices to old ones and learn medicine the same as any other trade, had surely many good features, particularly when one was fortunate to get into the hands of an able master, but not into the hands of Dr. Sangrado or Dr. Cuchillo¹ of Gil Blas de Santillana.

One of my patients, the 82-year-old Countess von M., in Mailand, still spends a part of the day on philosophical studies. Her thinking ability and judgment are those of a 40-year-old woman with great education. She has in her castle a large library under the charge of special attendants. I had even opportunity to admire her judgment in sculpture when I once happened to be present when she was giving a young sculptor, whom she educated, advice in regard to his studies. This lady manages, together with one of her relatives, several of the largest industrial establishments in Italy.

Calmness, reflection, consideration, cautiousness, which are the requirements for criticism, characterize the mode of thinking of the aged and influence also all their actions. In difficult, dangerous investigations one would, therefore, feel the safest under the guidance of gray, older men.

When I make a trip into the mountains with many precipices I always prefer an old driver to a young one, but when I have to make a call on a patient in Carlsbad in a hurry I prefer to have a young driver. In wars we observe the same; Napoleon and his younger generals were like a whirlwind; they were bold, very often rash and quick to strike before the enemy had grasped the situation. This well characterizes the war tactics of a young general, and he is best adapted for offensive war; in defensive war, however, old generals will very often be more in place. In case of organizing or equipping an army the latter will also exhibit more caution. With few exceptions the best service will be rendered, as is seen, for example, in Marshal "Vorward" and Moltke at mature middle age, because the offensive as well as the defensive war would be more actively

¹ Sangrado is the Spanish word for bloody, and cuchillo for knife.

carried out at that age. Here are very often combined the faculties of the youth with those of the aged.

Now, whereas too much of criticism characterizes the intelligence of old age and too little of it and the predominance of phantasia characterize youth, the mature middle age possesses a combination of both. It is, therefore, observed that this is the period in life which is most particularly favorable for valuable mental activity; and, in fact, we find, when we study biographies of great men, that their best creations, their greatest discoveries have mostly been made at such an age, and that most of these men have only become known at such a time. Of course, there are also in this respect individual exceptions, as, for instance, of great men, that their best creations, their greatest discoveries conic section at the age of 14.

Among the musical composers the genial faculties manifest themselves at the most early period, as, for instance, in Mozart, Haydn, Beethoven, but it must be taken into consideration that in these instances the fathers have already been professional musicians, and that the little ones have been put at the piano when they had barely been able to manipulate their fingers. Some of them have also been compelled to contribute to the support of their families very early, as, for instance, Beethoven and Mozart. By exercise and studies they were enabled to acquire knowledge and experience which was helpful to them in advancing their own original creations. Those children who mature early manifest during their childhood the otherwise very rare combination of the two faculties, the critical and the imaginative, which characterize the genius; the latter is not very rare in children, but the first is found very seldom. This is very natural, because criticism can only be based upon experience gained from facts. The younger the age of the child, the less it has had opportunity to gain experience. While the brain-cortex of a newborn child is not altogether like a blank sheet of paper, yet there is very little written on it—only that which has been brought into the world as inheritance in the form of a

limited number of nerve-cells with their prolongations, which serve for association processes. The function is at that time only in the form of instincts, and depends on the activity of the organs of senses. The human child is, in reality, still much less developed mentally than many an animal. The suckling is, during the first weeks of life, not able to think. Its movements are purely of an instinctive, warding-off, kind. Its whole mental life, if we can speak of such, is limited to the action of the organs of the senses, mainly taste, smell, hearing and sight. During the first days, even weeks, the activity of these organs hardly exists. But after a few weeks, through the activity of these organs, they accumulate pictures of various impressions, agreeable and disagreeable, pretty and ugly, which, depending on the degree of function of the organs of sense, will be more or less distinct and will be retained more or less long. Everything that the child knows, all its intelligence, is built upon the activity of his organs of sense, particularly that of sight.

How greatly the sense of sight influences intelligence is particularly seen from the investigations of Berger.² He sewed together the eyelids of newborn pups so as to be sure that all the impressions through sight had been excluded. After a year elapsed the brain-cortex of these animals was compared with the brains of other pups, some of the same litter, and it was observed that the processes were less developed and the cells pressed more together. He also found in the brains of persons, who on account of some eye disease had been blind over twenty years, that the cells in the visual region were smaller than those in normal persons, and were closer to one another.

Through the organ of sight the child receives an immense number of impressions. He will naturally have a desire to interpret and make application of them, and to this end speech offers him an immense service, and only with the aid of the

² Berger, Beiträge zur feineren Anatomie der Grosshirnrinde. Aus dem Laborat. der psychiatrischen Klinik zu Jena (Monatsschrift für Psychiatrie und Neurologie, 1899, S. 409).

latter his whole education and culture, all his instruction can be accomplished. And, therefore, we see that men who are deaf from birth and can neither hear nor understand sound or speech of others and who cannot speak themselves, remain more or less backward in their intelligence.

This is clearly seen from an experiment of the ingenious Indian Emperor Akbar.³ To study the influence of speech on man he had thirty newborn children brought up at a distant place under the care of female servants who were forbidden by death penalty to speak even a single word. All children thus brought up became simple. The organs of sense were apparently intact, but the forced dumbness had influenced them unfavorably. These children were only able to stammer, just as we see in the deaf born, who still possess their power over speech, but can never use and develop it.

How much the speech stands in relation to intelligence we can also see from the fact that the tribes which are on the lower plane of civilization have only a primitive speech and a very meager vocabulary. They have only words for concrete objects and for the numerals up to 5 or 10, as can be seen from the language of the Mafulu in British New Guinea. Something similar may be, moreover, observed in some small children whose mode of thinking corresponds often to that of the uncivilized natives, and also to that of the insane. The thought of the child is concentrated only on concrete objects which are brought to his attention by the organs of sense. Through the latter a great number of new impressions are brought to him, of which the strongest, for instance bright colors like red, excite his attention the most, and will be retained in his memory the longest. The otherwise inattentive child is naturally captured first by such strong impressions. Impressions which excite them less disappear more quickly from his memory. A child learns

³ Persönliche Mitteilung des Kaisers Akbar an den Missionar Pater J. Xavier, S. J., im Jahre, 1594, in Le Père Jouvencey, *Historie de la Compagnie de Jésus*, xviii, No. 14.

a language quickly, but forgets it also extraordinarily quickly if it does not remain in practice. An interesting observation in this respect I made recently on a 3-year-old child which I saw in the Lyceum during my visit to Dr. Rollier's clinic. This little Hungarian girl was in Rollier's clinic four months. When she entered the clinic she spoke only Hungarian, but after two months she learned to speak German and French; after the third month, however, she forgot her mother tongue, so that when her mother came from Budapest, speaking only Hungarian, the child could not understand her at all. When I attempted to speak to this child, who was away from home only four months, in her own mother tongue, she could not understand a single word, even the offering of such dainties as would gladden the heart of any Hungarian child. The child spoke apparently just as well German and French as its playmates, but not a single word of its mother tongue.

In teaching a child the frequent practice of that which it had learned must, therefore, be particularly considered; it must not be forgotten, however, that those things are best retained which were well understood, and which have been well noticed during the lesson. A child notices and understands best a concrete subject, because his thinking is only concrete. He builds his perceptions of an object upon the impression received by his visual organs, because he can think of something abstract only with difficulty. As an illustration of this I would like to report here the result of my observation of a 6-year-old Dutch girl. I asked the child, "Tell me what is a butcher." The child answered, "A butcher is a man who has on a white apron." Another 10-year-old girl said, "A butcher is a man who sells meat." Children thus judge strictly according to what they have seen. The judgment of a child, its mode of thinking, is characterized by the grasping of, not the essentials, but the non-essential, external features, because it has noticed these and its attention was only excited by them. It was, therefore, not the essentials of the butcher, that he kills animals, which attracted

the attention of the child, but what it had seen, namely, that he had a white apron on and was selling meat.

The judgment of the child, consequently his thinking, depends naturally and mainly upon what he has learned and experienced. A young child, however, has as yet learned very little and can gather very few facts from experience. He lacks, therefore, discernment and cannot distinguish between what is possible and what is impossible, what is real and what is fictitious. He is naturally attracted more by the wonderful and fabulous, because this is more exciting and more captivating. Similar to a young animal, the human child is also more curious; everything new and glistening attracts his attention. He seeks instruction; this is fortunately inherent in human offspring—is always curious, particularly so a child with inherited intelligent faculties—puts numerous questions in regard to everything that comes in his way and excites his attention. On account of lack of material, consisting of facts gained from experience, he can form his opinion only with difficulty, and therefore conforms with the opinion of adults. He tries to imitate the grown-up, and the tendency for imitation is as if hereditary. The pictures memorized of what he has seen and heard, often subjects and occurrences bordering on the wonderful, inspire him to reproduce them in reality, to represent them. This is the cause for the inclination to play. The observation of Perez⁴ of what idea some children had of hell is very interesting. It was that of a big cooking pot on the stove with the bubbling soup in it, that was the devil's kettle. The boiling carrots, onions and potatoes were the damned. The superior "devil" was the oldest child, a boy of 12 years. When the fluid was boiling and one of the "poor souls" came to the surface the "devil" grabbed it and with the cooking spoon pushed it back into the "boiling hell!"

The usually limited thinking power of a child becomes gradually more mature, his power of judgment becomes more

⁴ Perez, *L'enfant de 3 à 7 ans*. Paris, S, 276.

free the more facts he acquires from experience during the course of years. The actual maturity of the thinking power manifests itself, however, only at the time of sexual maturity, when the sexual glands and the thyroid gland become fully active. Up to that time the thinking abilities of the boy and girl have much in common. From this time on, however, as soon as the sexual impulse becomes powerfully manifested, a radical difference in the thinking power takes place.

II THE INFLUENCE OF SEXUAL IMPULSE AND THE SEXUAL DIFFERENCE UPON THE INTELLIGENCE.

CHAPTER X.

THE INFLUENCE OF SEXUAL IMPULSE, THE EXCESS OF IT AND ITS ABSENCE, UPON THE INTELLIGENCE.

THE impulses are the factors which put the mechanism of the artistically built-up human machine in motion. They form the concealed incitements for all actions of man and for all manifestations of his physical and mental activity and creative power. Through the various excitations and perceptions which act upon the senses these become stimulated and the spark which they ignite sets the whole machinery in motion. Without sexual impulse there would be no love, and without love there would also be no poetry. Art and literature have received their greatest inspiration from the sensation caused by love, which is the expression of the sexual instinct.

Without imagination there can be no art, and nothing can stimulate it better than the feeling of love. It is the latter which is the best guide for the pen of the poet and the brush of the painter, and whose brain lacks this feeling will not be able to rise high; he will present only dead forms deprived of the spark of life. He will never be able to inspire others to worship and admiration as is done by the masterpieces of Michael Angelo, Leonardo da Vinci, Cellini, which have all originated under the influence of the great passion of their masters.

Poetry, and also artistic presentation, were the forms in which the sciences were taught up to some centuries ago. At that time fiction and truth were closely connected with one another. While, however, in arts the main rôle is played by phantasy, in sciences this is played by criticism. In sciences,

again, it seems that the ultimate stimulating cause was the instinct for need of nourishment, the gaining of possibilities for existence. It is, therefore, not unjustifiable to say that in the end art and literature were inspired by ardent sexual impulses, whereas the powerful impulses in science were due to the instinct of hunger, to the struggle for existence. We see, moreover, nowadays that the majority of the inquisitive adepts devoting themselves to the sciences are guided in that respect by the desire to earn the daily bread, and by the endeavor to establish a source for existence.

While criticism plays the dominating rôle in the sciences, phantasy cannot be entirely missed; and, in fact, the most ingenious inventions and discoveries of the last century have been made with its aid. What really characterizes great, genial men is that they possess both imagination and criticism, a faculty which is very rare among scientists of our time, because in our schools, due to the dry methods of instruction, only criticism is cultivated.

We have already mentioned the relations which exist between fancy and sexual impulse, and, indeed, when we glance over the life histories of the great men in those domains, in which fancy is a dominating factor,—as, for instance, in poetry, drama, art, music,—we will very frequently find indications of a very vivid sexual impulse. The adoration of women by Goethe is well known; he actually could not live and work without having women around him. Even as an old man he was always in love, and, according to the local reports, it not infrequently happened that when “Herr Goethe,” as the girls in Carlsbad used to call him, would meet young girls promenading in the woods, he would escort them for hours. When Shakespeare considers love as having originated from the heavenly kingdom and created a number of gracious, beautiful, as well as demoniac female types, as Julia and Miranda, Ophelia, Virginia, Desdemona, Cordelia and others, which he so realistically pictured, he certainly could not have done it as a blind man would describe

colors, but he must have studied their prototypes in life. He not only knew love, but he was also acquainted with occasional consequences of it, as in his "Timon of Athens," Act 4, Sc. 3, he describes, almost as a physician would do, the terrible symptoms of tertiary syphilis, and the same we find in "Hamlet," Act V, Sc. 1; in "Henry IV," 2 p., Act 1, Sc. 2; "Henry V," Act 5, Sc. 1. Rubens would also not have painted with predilection luxuriant figures in such a number if he had not found particular pleasure in such opulent forms. Very often in these great men we see confirmed the saying of Buffon, "qu'il n'y avait de bon en amour que le physique," and some of them have, like Baudelaire, kept a book about all their love affairs.

Among the great professional men, however, in whom the critical faculty predominates, such as great thinkers and scientists, sexual impulse is more restrained, at least it is less pronounced; and it is more so among mathematicians. Among representatives of the latter science, in which strong criticism plays such a great rôle, amorous natures are rather more rare. In some countries it seems to be the popular belief that mathematics excludes love. It is narrated, for instance, of Jean Jacques Rousseau, that once during his stay in Venice he visited a charming Venetian lady, whom he describes in his Memoirs as very beautiful, but when, instead of starting at once a love affair, he, as was his habit, first sat down and became engaged very deeply in thought, she lost her patience and disdainfully exclaimed: "Lascia le donne e studia la matematica" (You had better let women alone and study mathematics).¹ Moebius is, moreover, of the opinion that women have a congenital aversion to mathematics or anything dealing with figures. We find that among great thinkers very active sexual impulse is more rare than among artists and playwrights. Kant, the man of pure reason, did not associate much with women, and remained a bachelor all his lifetime. It is true that he was of small, insign-

¹ According to Moebius: "Die Anlage zur Mathematik," Leipzig, 1909, Seite 91.

nificant stature, whereas most women, for reasons known only to them alone, show more preference for tall, broad-shouldered men than for those who possess mental faculties. Spinoza, when he was a grinder of optical lenses, would not leave the house where he lived for months at a time. He was continually studying all that time, and such protracted studying is generally not favorable for engagements in love affairs. He, previous to this time, boarded with a beautiful widow, but, unlike other boarders of such widows, he did not seem to have been in close relation to her at all, otherwise she would not have raised his rent, so that he was compelled to move somewhere else. It seems, however, that not all great thinkers have been such heroes of virtue and avoided the company of women. At least it is reported of some that they have left illegitimate children, as, for instance, Descartes, Galilei, Leibnitz, Franklin, and others. The fact that most of these men remained single I would not interpret as proof of their being women-haters; indeed, in some of them it is rather an argument against it. Of many we know that they have been unfortunate in love, as, for instance, Pascal, who admired the sister of a count; and Spinoza, who in his early youth loved the daughter of his teacher, Dr. von Enden, but she preferred a richer man. Particularly of Rousseau and Voltaire, nobody, even their worst enemy, would assert that they were women-haters. Rousseau was already in love during his early youth with Madame de Warren, and had also a number of love affairs later on. He also repeatedly came in conflict with the laws of public morals. Voltaire, again, was only happy when he had the opportunity to compose songs on beautiful women; he kept up love affairs with many of them, and also had in his home a beautiful young girl whom he brought up.

After all that has been stated above, it seems that the life of most great men is stamped with a strong sexual trait, and this already indicates that a connection possibly exists between disposition to genius and sexual impulse. This assumption finds, however, more support in the fact that in absence of sexual

impulse or after castration in childhood, the mental faculties remain entirely undeveloped. This is the case with many castrates and eunuchs of the Orient.

According to the corresponding descriptions of all travelers in the Orient, eunuchs show a number of peculiarities which are not compatible with high intelligence, such as childish behavior, laziness, helplessness, greediness, cruelty, superstition. Their cunning and shrewdness is just as little a sign of intelligence as the shrewdness of our own peasants. We would also search in vain throughout all the pages of the world's history for even a single name of a castrated genius.

The unfortunate Abelard was already 40 years of age when the angry canon, the uncle, enraged because of the seduction of his niece Heloise, had him castrated. In regard to the fact that Abelard still retained his mental faculties after this misfortune, although they were not of as high a grade as before, it must be pointed out that it is of great importance whether the sexual glands are removed during childhood or during manhood. It has been mentioned already that these glands exert a powerful influence upon the metabolism and blood formation, and also upon the development of the brain-cortex. Whenever they are absent or remain undeveloped and inactive, the development of the brain-cortex will suffer, and, therefore, we find that in idiots, cretins, and insane very frequently, as mentioned in other parts of this book, the sexual glands have not descended to their ultimate normal locations, or are very minute. When, however, the brain-cortex, as is the case with the adult, is already fully developed, then the absence of the sexual glands is naturally not of such great importance. We see here a condition similar to the one in regard to the thyroid gland. When the latter is absent in childhood, it leads to idiocy or cretinism; when, however, it becomes degenerated in the adult, then the acquired mental faculties are retained, but it becomes difficult to acquire new knowledge.

Very convincing in this respect is, that in a boy, for in-

stance, whose sexual glands have not descended yet, and whose mentality is insufficient and limited, a change for the better will take place as soon as puberty sets in, and the glands have taken their normal position, assume their normal size, and their secretory activity has begun. These conditions have apparently found recognition before the law, inasmuch as it is determined that responsibility of children before court begins only after the fourteenth year. It would be more appropriate, in my opinion, if the law would recognize as the term for the beginning of responsibility, not a certain age, but the actual beginning of puberty, which is the descending of the testicle or the appearance of the first menstruation. I would like to call attention here to the fact that we can see every day young defendants in court who, even at the age of 16 years, have not reached puberty and manifest the mentality of a child. To punish those I consider as a cruelty, because they are not fully conscious of their acts; it is just as cruel as if the law would hold children responsible for their acts. As an interesting example I would mention that when the Spaniard wants to indicate an energetic and courageous man he uses the expression, "Tiene cojones" (he has testicles). It is synonymous with the expression, "Un hombre de corage" (a daring fellow).

Sometimes we find already in very young children signs of a particularly early mental maturity, but at the same time we find in these cases, almost without exception, greatly developed sexual organs which do not at all correspond with the age of the individual, and very frequently we find also onanism. Here we see, therefore, very distinctly the connection between the sexual impulse and mental faculties; *sexual prematurity is corresponding with mental prematurity*. As a very instructive example I may mention here the French writer Restif de la Bretonne, whose book, "Monsieur Nicolas ou le cœur humain dévoilé," containing the description of all his numerous love adventures, produced quite a sensation at the end of the eighteenth century. When he was 8 years old he began to write

novels, and very soon after he began also to seduce young girls. In my book "Old Age" I have already mentioned a case of a 6-year-old boy who tried to play not at all platonically father and mother with a 5-year-old girl, and at the age of 4½ he knew by heart all the main cities of the world; he was an exceedingly intelligent and inquisitive boy. I may call attention to the fact, in this connection, that almost all great talented men were early matured children. As the best proof, however, for the assumption that with an early sexual maturity there is also associated an early maturity of the mental faculties, I would like to point out here the condition existing in tumors of the hypophysis. In this instance we observe, for example, in children of 4 or 5 years of age a conspicuously great development of the sexual organs, and simultaneously with it such a surprisingly early mental maturity that, for instance, in one case of Frankl-Hochwarth,² a 5-year-old boy, in whom the pubic hairs, as well as the sexual organs, had been entirely developed, was holding discussion about the immortality of the soul. So, also, a boy of 4 years, observed by Oesterreich and Slawyh,³ showed behavior of an older person. He was 108 cm. long and had entirely developed sexual parts with a profuse growth of pubic hair. That the degeneration of a single organ, as in this case of the hypophysis, should have produced this conspicuous development contradicts all our pathological conceptions; we are rather compelled to attribute it to the intercorelation which exists between all the ductless glands. The conditions in regard to sexual impulses, as they exist in women, also speak in favor of it. As a rule we find that girls who menstruate very early manifest also an early mental maturity; on the other hand, those girls who begin to menstruate very late, as, for instance, in chlorotic-anemia individuals, remain backward in their mental

² Von Frankl-Rochwarth, Ueber Diagnose der Zirbeldrüsentumoren, Deutsche Zeitschrift für Nervenheilkunde, 1909, 37.

³ Oesterreich und Slawyh nach A. Schüller zitiert in innere Sekretion und Nervensystem, Bd. iv des Handbuchs der Neurologie von Lewandowsky. Berlin, 1913.

faculties. If, after giving such girls thyroid or ovarian extract, menstruation sets in, they also show progress in school. Similarly, we observe in women in whom, at the age between the end of the fortieth and beginning of the fiftieth year, the sexual glands have ceased their activity and menstruation stops, there is not rarely noticeable a diminution of the sexual impulse. The sexual impulse is, *in general*, less vivid among women than among men, and the same has been observed by Charles Darwin among animals. And the fact that we find among women fewer geniuses, and, *in general*, also a less well-developed intelligence,—the fact that there are many women who are far more intelligent than men does not speak against it,—is undoubtedly to be considered from the point of view just advanced. Particularly intelligent women have, as we often learn from the pages of the world's history, manifested a very vivid sexual impulse." Of course, we must greatly distinguish between sexual impulse and sexual activity. Many a woman may be a glowing volcano, and is, nevertheless, able to restrain herself with a power which is entirely unknown to the man, just because, on account of her intelligence, she sees before her eyes the occasional bad consequences, physically as well as socially, which may follow a yielding. It is certainly very suitably arranged that women possess that power of resisting the sexual impulses which is more or less lacking in men. This is entirely in the interest of race preservation, because unrestrained submission would endanger their organs of reproduction, and might injure, or even destroy, their fertility. *Virtue is, therefore, a judicious arrangement of nature.* Of course, many women make of necessity a virtue, while the unsatisfied sexual impulse is nagging like a worm, and it may, by a deleterious influence upon the nervous system, produce in men, as well as in women, very bad effects upon the mental faculties.

Sexually cold individuals are better off in this respect, but among them high intelligence may not be found very frequently; they are rather more liable to possess the gift of criticism than that of phantasia.

CHAPTER XI.

THE INFLUENCE OF SUPPRESSED SEXUAL IMPULSE AND ONANISM.

IN subjects with a very vivid sexual impulse, a continued suppression and non-satisfying of it may often cause much pain and agony, bodily as well as mentally. Physicians of experience, and particularly nerve specialists, would hardly be able to deny that continual non-satisfying of a vivid sexual impulse is very frequently the source of a very serious disturbance of the nervous system, of the temperament and of the mental state; and this is particularly applicable to a person with hereditary neuropathic disposition. As in my previous publication,¹ I should like here also to point out how often, in single persons of a certain age, living in total sexual abstinence, neurasthenia and hysteria become manifest, unless we have to deal with members of the ministry, who, by many years of training in novitiates, may be able to entirely kill these feelings. Regarding the cause for the condition mentioned we may allude to the facts revealed by experiments and practical experience. From the investigations of Regaud² and Mingazzini³ we have learned that in animals which are kept in total abstinence for a long time the sexual glands in the males, as well as in the females, undergo degenerative changes. We know, however, that, as already mentioned, changes in these glands may also produce disturbances in the nervous system and spirit. Experience teaches us, moreover, indisputably, and every practitioner would confirm it, that continual sexual restraint may, in some cases, cause disorders of the sexual faculties, even impotency.

¹ *Old Age, l. c.*

² Regaud, *Comptes-rendus de l'association des Anatomistes*, 1903, S. 198.

³ Mingazzini, R., *Laboratorio di anat. normale*, 1893, iii,

The investigations of Loisel⁴ and of a number of other investigators have shown us that the reproductive glands eliminate a toxic substance which, when injected into other animals of the same sex, would prove to be poisonous. This is probably the cause of the fact observed, that individuals who, after having previously led a regulated sexual life, have restrained themselves for some length of time, manifest abnormal excitement with great nervousness, insomnia, lack of appetite and inability to do any mental work. We see these symptoms disappear at once when opportunity for sexual intercourse is again restored; this is, for instance, observed in married couples returning home after a long journey. As a very instructive example I would like to mention the case of a fish merchant from abroad whom I treated for diabetes. After the first week he complained to me that he felt the separation from his consort very badly; a few days later I found that he was nervous, had insomnia, and was very much depressed. The influence upon the sugar elimination was very interesting. The patient had only a slight attack of diabetes, and the small quantity of sugar of 0.5 per cent. disappeared after a week's treatment. When he became excitable through his abstinence, however, sugar reappeared, 0.2 per cent. on the twelfth day of the treatment, notwithstanding strict diet; at the same time he lost 7 kg. in body weight. Notwithstanding the strictest diet, it was impossible to free this sexually excitable patient from his sugar, and I, therefore, advised him to return next time with his wife. Anyone having experience with diabetes knows how easy elimination of sugar is influenced by nervous activity.

After all that has been said we must assume that in sexual abstinence an accumulation of toxic substances, with injury to nervous system, takes place; and after the impulse has been satisfied, together with the elimination of these substances, the injurious influence ceases, and similarly to the action produced by pouring oil upon a stormy sea, here also the excited waves

⁴ Loisel, *Comptes-rendus de la Société de Biologie*, 1907, p. 1759.

quiet down. Moreover, the various preventive measures used by married couples to prevent conception may produce the same effect as the unsatisfied sexual impulse, and have bad influence upon the nervous system. An excited sexual impulse is only very rarely satisfied in this way.

The disorders of the nervous system caused by the restraint of very vivid sexual impulses are naturally associated frequently with unfavorable influence upon the mental faculties. In such cases there is often observed an undesign for mental work, and the entire thinking ability in general is affected, as we will see later on. There is a downheartedness, a very striking absent-mindedness, an inability to take notice of things, an aversion for thinking over any problems. It can be easily understood that under such circumstances the progress in study cannot be a satisfactory one.

Remarkable as it may appear, men may not infrequently be met with, who, notwithstanding their very vivid sexual impulse, have never had as yet any intercourse with members of the opposite sex, and this is found not only among monks. I have, myself, been consulted by such men who have manifested a great number of nervous affections. One German volunteer soldier, for instance, had a moral aversion toward all such "animal instincts"; he was a very handsome young man, and was frequently led into temptation by the girls, but at the last moment, when the danger was the greatest, he repented and the partner met with disappointment. He masturbated extensively to make himself inert against such temptations. I diagnosed in that patient that he had dyspepsia, with pains in the stomach and hyperacidity; also symptoms of neurasthenia which have been producing unfavorable influence upon his studies. In a case of a druggist who, since the death of his wife eight years ago, with whom he lived happily, anxiously avoided any intercourse for fear of infection, I also found neurasthenia, obstinate insomnia, and other nervous symptoms. Reflecting or calculating, or any mental strain in general, caused him great

inconvenience, and, not to be tortured any more by it, he sold his drug-store. It is no wonder, when such persons, who are so badly tortured by protracted suppression of vivid sexual impulse, cannot follow any mental occupation, and when, for some reason or other, they cannot or do not want to get married, finally take refuge in masturbation to get relief. It is assumed by such experienced authors as Havelock Ellis and Iwan Bloch⁵ that in such cases masturbation may act favorably. Based upon the statements of such patients, Bloch assumes that after such discharges they are relieved from a psychical pressure as from a burden, get increased mental energy and creative power. But it would be wrong to generalize this fact. The rule is certain that masturbation produces a number of bad consequences if it is habitually practised, and it is particularly injurious in children. Such children, if they masturbate excessively and daily, progress in their studies only with difficulty; they are very absent-minded, look sleepy and dreamy, cannot follow attentively the instruction given by their teachers in school; their perceptive ability and their memory have suffered very badly.

Sometimes in such persons, who have indulged in masturbation excessively, and who have carried it on for years, frequently since childhood, there can be observed very disagreeable disturbances and, in cases of hereditary disposition, even mental diseases. Sometimes, however, masturbation is a sign of such a predisposition.

On the other hand, in regard to bad consequences of masturbation, no generalizations should be made, because this may be found sometimes in men very prominent mentally in whom it certainly could not have done very much injury.

I had as a patient a few summers ago a burgomeister, 50 years of age, who, notwithstanding being married, confessed still to masturbating frequently. Fürbringer⁶ knows of a middle-aged

⁵ Iwan Bloch, *Das Sexualleben unserer Zeit*. Berlin, 1908, S. 469.

⁶ Fürbringer, in *Eulenburg's Enzyklopaedie*, IV Aufl., xi, S. 55.

instructor who masturbated for a long time, notwithstanding being married, and manifested nevertheless a rare ability as a teacher and scientific investigator. Havelock Ellis even reported a list of men of genius, as well as modern great artists and writers, who have indulged in that vice to a great extent. I personally am inclined to consider such cases of excessive masturbation, with at the same time perfectly retained mental faculties, as exceptions.

CHAPTER XII.

THE INFLUENCE OF SEXUAL DIFFERENCE ON THE FACULTY OF THINKING—THE INTELLIGENCE OF A MAN AND THAT OF A WOMAN.

MAN and woman differ from one another in their way of thinking. This is quite natural, because if it is true, and no one can be in doubt about it, that mental functions are very much influenced by the functions of the body, a woman naturally must think differently from a man as she differs from him in the skeleton, the muscles, the skin, and even in regard to the details of the brain.

The greatest difference of all between man and woman is the structure and functions of their respective sexual glands, and these, as we have seen, exercise a very great influence upon the mental activity. This influence is, however, noticeable in a woman to a much greater extent than in a man. The ways and means of a woman's thinking are affected in the highest degree by impulses and influences taking their origin from the sexual glands, and of which she, herself, is frequently not aware. The physiological function of her sexual glands alone affects a woman bodily as well as spiritually, and that this necessarily affects her thinking is quite natural. It also has to be kept in mind that the sexual impulse, in general, is less vivid in women than in men; and in view of the fact, moreover, that this impulse, as we have already shown, has rather an inciting effect upon thinking ability, the absence of it—sexual coldness—much more frequent among women than among men, may have unfavorable consequences. We also must consider that, just on account of frequently existing weakness and imperfect development of the sexual glands, chlorosis and anemia in girls and women are of frequent occurrence. Such conditions are surely deleterious to the circulation in the brain-cortex, and manifest

themselves by frequently recurring fainting spells in such patients. We also must not forget that in all domains of pathology, besides morbid changes characteristic of the highest grades of certain diseases, there may occur a great number of less developed stages of these diseases, the manifestation of which do not at once attract our attention.

If we keep in mind this important pathological law we are able to get a better understanding of cases which seem to us obscure. So much is certain, that processes taking place in the female sexual organs have a decided influence upon the blood-circulation in the body and in the brain, and in consequence also upon the thinking.

That the sexual sense in general is less vivid in women than in men is practically a very suitable arrangement. If it was just as vivid they would be less able to resist the continual wooing of men. The result would be an exhaustion and a serious injury to the sexual glands due to overactivity, and this would probably tend to render conception more difficult, and the human race would be threatened with extermination. From this point of view syphilis and other venereal diseases could be considered as a horrifying measure used by severe Mother Nature, and may be looked upon in general as serving a higher purpose, sometimes even as a beneficial phenomenon.¹ This speaks very plainly for the moral, that the good and the evil in this world are a necessity, and very often serve a good ultimate purpose.

Virtue is, therefore, actually forced upon women. It is an extreme necessity! If there were no ill consequences, virtue would frequently waver. Notwithstanding the efforts of a rigid education to deaden the sexual impulse, the voice of love would triumph if the maiden's virtue were not strengthened and supported by the fear of possible consequences. She is actually driven to concealment and disguise of her feelings. This is the reason why the art of disguise is developed in women to its

¹ Lorand, *Old Age*. See there the argumentation for this view.

highest degree, and we see, in fact, that women representing it are natural-born actresses, and always attain a much higher degree of accomplishment in dramatic art than men. Artists, such as Rachel, Sarah Bernhardt, Duse, will never be found among men. The greatest female geniuses are generally found in this calling. The possession of the art of disguise and performance is the reason why the art of imitation is much more highly developed in women than in men.

Women are keen observers, and are particularly great in observing fine details. This is also the reason for their manifesting particular talent for the art of painting. The number of young women able to make a good drawing and painting is exceedingly large, but when, however, we examine their pictures we find that, while all details are admirably presented, the essential part is lacking; there is no life in the picture! Women often do great work in painting flowers, plants, landscapes, etc., but they very seldom produce anything significant in their pictures of living humanity. Woman's intelligence is more of an imitative kind; she is lacking, more or less, in creative ability. Artists like Velasquez, Rembrandt, Raphael, have never been found among women.

It is interesting to note that the few women artists like Rosa Bonheur, and several great artists whom I know myself, manifest manly traits.² Whereas, figures and objects painted by other women show an attempt to present the tender view of women, these women have handled their brushes vigorously like a man, and have put real life into their pictures.

In music woman is also able to give a good presentation, just as in painting; she is able, here also, to copy excellently, but in most instances, however, her playing lacks the life and vigor of that of a man. In case we have before us a great artist, then we find her playing, not like that of a woman, but of a man. She would be able to play wonderfully well such pieces as "Don Juan Phantasie," by Liszt, as I saw it presented

² See Lorand, *Old Age*.

by a girl of 18 from Vienna who gave concerts. She had hands like those of a man, and played like a full-grown man. Never has a woman's brain produced such great compositions as those of Beethoven, Mozart, Haydn, Händel, and many others, just as it has never produced poetry to equal those of Shakespeare, Goethe, and Schiller. Many of the renowned actresses understand enough to give masterly portrayals of persons and characters; they are able to make the acts most interesting in all their details, but often we find great mistakes in the psychology of their characters. The reason for this is that the act is presented too much from the woman's point of view. A woman gives her decision too subjectively; she looks upon everything from the personal standpoint; she sees everything according to her own sensations. She is, first of all, a sensitive human being, and the predominance of the sensitive point of view influences her judgment. Like children, some women base their opinion upon a few concrete cases without abstracting it from the total number of cases. It thus happens that many women form their opinions according to exceptional cases which they have seen, whereas a man bases his conclusions upon the entire number or the majority of the cases. It has frequently happened to me, when I have prescribed some medicine for a woman, to find her objecting to it, because it had not done any good to one or the other of her acquaintances or relatives. It is thus very difficult for her to form a general and independent opinion. She bases it rather upon the details of the subject, often only upon trivial things. She is unable to grasp the cardinal points, and observes more the non-essential things and forgets the more important ones. In this respect her thinking approaches more the thinking of a child, and just the same may be said in regard to her great inquisitiveness. In fact, some women remain all their lives grown-up children.

Because a woman pays such great attention to trivial things and devotes to them more interest than necessary, these disappear with more difficulty from her memory. Thus it comes that

she may feel a grudge against some one on account of some small matter, which she may not forgive nor forget for years, and some not for a whole lifetime. *I would rather incur the hatred of ten men than of one woman.*

However, just because a woman devotes great personal, often very warm, interest to small things, which do not seem to us essential, she may become much more interested in essential matters serving higher ideals, and may become very easily inspired with enthusiasm for such matters.

A woman possesses the gift of being able to sacrifice herself. Sometimes her motives are misunderstood from the man's standpoint, and are attributed to her inferior thinking ability. As a very characteristic example I would like to cite here the case of the wife of General Lavergne, born princess of Grimaldi, Monaco. Her very old husband, deathly sick, was taken, in a dying condition, before the revolutionary tribunal and sentenced to death. *She, a very young and very beautiful woman,* visited first the members of the tribunal and the public attorney Fouquier Tinville personally, and on her knees begged for his pardon. It was of no avail, and the dying man was sentenced to death. The young wife, who was present in the court-room, broke out with the exclamation, "Vive le roi," so that she could die with her husband.

Where could a young man be found who would be able to do a similar thing for his old, sick wife? I do not think that such a one could be found or was ever born! But now the psychological problem becomes more complex. On the evening preceding her execution she declared that she was pregnant, and in consequence of it she was pardoned. On the following day, however, she wrote to Fouquier Tinville that she had told a lie and did not wish to buy her life with a lie. As a result the bloodthirsty man, who could not do otherwise, had the unfortunate young creature executed.³

It is very difficult for us men to understand the sphinx-like

³ A. Dunoyer, Fouquier-Tinville, Paris, 1913.

act of this young woman. Generally speaking, where is the man who could rightly understand the motives of a woman's actions? Her mode of thinking is fundamentally and entirely different from ours! Her soul and nerve-life is toned up exceedingly fine. If we compare the nerve-cells of the female brain-cortex and all their conducting threads with a harp (this comparison is probably not overdrawn), then the sensitiveness of the strings of that harp is so exceedingly fine that they begin to sound on the slightest possible motion of the wind, and then still continue to resound for quite a long time. Many impressions, agreeable as well as disagreeable, even those which are not of an intense kind,—even trivial things—are retained by a woman very long. She is for a long time thankful for any favors shown, even the smallest, as I myself as a physician, and every one of my colleagues, have had opportunity to observe, whereas men forget their physician very soon after they are cured. Thus, physicians have very often occasion to be thankful to women for their reputations. Besides thankfulness and fine feeling, women possess a whole number of noble qualities which are lacking in men. Unfortunately, the feelings of a woman are frequently easily displaced by new impressions, if they are anyway well accentuated. Remember the Italian proverb: "La donna e mobile." And this, like all proverbs, speaks the truth, particularly in regard to beautiful women. Such a change of their feelings is very much facilitated by the many temptations which may serve as an excuse for them. Through her many alliances a beautiful woman becomes, moreover, spoiled and overindulged, and her vanity very strongly awakened, and this acts very unfavorably upon her mind and spirit. To this may possibly be attributed the fact, frequently observed, that the mental faculties of women are often in directly opposite ratio to their external appearance.

Those men who select their wives only on account of their external appearance really deserve the fate which frequently befalls them. Men who allow themselves to be captivated by the external beauty of a woman without considering her inner

graces, I consider as mentally inferior, particularly when such influence is a lasting one. To the woman whose sole calling it is to be a beautiful woman, therefore a "professional beauty," dressing and toilet hardly leave any time to cultivate her mind, and in all probability Moebius had this kind of overindulged, affected woman in mind when he spoke of the psychological feeble-mindedness of woman. Of course, the perverted education, carried on through centuries, which only kept in view the external appearance of a woman and neglected the cultivation of the mind has done its best to develop such women. Now, however, a new generation, very active mentally as well as bodily and very intense, is growing up, and it remains as an open question whether the right of voting should be withheld much longer. If women, however, want rights they must also take upon themselves responsibilities. In my book on rational diet I have already advocated for women the requirement of one year of service in a military hospital and in kitchens of public institutions, and here I will add to it, in the interest of the education of children of the poor, also the service in kindergartens.

Those who could not pass the examinations at the end of one year should be compelled to spend another year. To the professional beauties, who lack knowledge, an opportunity would be given to acquire it; those young women who carry on the lives of drones at home should be compelled to work. Lazy individuals, male as well as female, should not be tolerated in any modern State. Always being idle and never doing a stroke of work, either physical or mental, is unworthy of any self-respecting human being. At present, however, the number of hard-working women and girls, both physically and mentally, is constantly increasing. Some take up scientific callings and do excellent work therein. To prove this I have only to call attention to female colleagues, who have published results of very important investigations. It is interesting, also, to note that some of these women bear great resemblance to men in their

facial expressions; for instance, if one examines the picture of a physician on the frontispiece in one of the latest numbers of the journal "Femina" one will notice this resemblance. Her profile is, in my opinion, rather a masculine one. This woman, whom I have met in a physiological laboratory in Belgium, has published some very good papers on the physiology of the nervous system. Many of this type of women dress like men; for instance, Rosa Bonheur. Almost all female geniuses, who are mentally distinguished, have masculine faces; for instance, Sand, Eliot; and some of them also feel like men, as Baskirtscheff describes it in her diary. A great woman artist whom I know, a Belgian, smokes strong cigars like a man. On the other hand, according to Wilhelm Fliess, many male geniuses have a female trait in their exterior, or in their feelings. It may be that in this trait of transition into the other sex is to be found the key to greatness, whereby to the qualities of one sex those of the other are added, thus supplementing them. This may become very valuable. We see it very distinctly from the great services women have rendered us in medicine as assistants in microscopic, chemical, serological, and Röntgenological laboratories. No man can compete with them in this field, because their senses are, in many respects, more delicate, and thus they possess many inestimable qualities and abilities which in men are entirely lacking. It is only the will of nature that the female qualities should supplement those of the male. *A woman is, consequently, the valuable supplementary half of the man.*

III. HARMFUL INFLUENCES UPON THE THINKING ABILITY AND THEIR TREATMENT ACCORDING TO THE NEWER PRINCIPLES.

CHAPTER XIII.

CAUSES OF INSANITY AND THEIR PREVENTION.

EVERY man's future, in regard to his physical as well as mental condition, is, in the main, undoubtedly predestined already at his birth. The fate of the man is often outlined in the germ from which he originates. It rests like a burden upon the man, that he must atone bitterly for the sins of immoderation of his parents, grandparents, and even great-grandparents, and the curse of these sins still pursues him even to the third generation. Woe to him if he is born the offspring of syphilitic parents, or those addicted to the use of alcohol—if he is a child of habitual drinkers. Frequently he comes to the world badly crippled physically, and still more so mentally. It is noticeable that the mentality is the more affected. Probably this is to be attributed to the fact that man is, just in respect to mental development, standing on a higher level than animals.

Of course, such a congenitally heavily burdened offspring is frequently found occupying a position not very much remote from the animal. These highly idiotic subjects frequently have devil-like faces, are entirely helpless, often blind and paralyzed, entirely deprived of their senses, discharging their bodily functions in bed, damned by those around them. Such monsters fill entire wards in some insane asylums, and mentally they stand below the animal. They represent the personification of the curse which rests upon them through the fault of their progenitors.

If, therefore, an attempt is made to reduce the number of insane to a considerable extent, then all possible means should be used to prevent all individuals, who are not cured from syphilis, or who are habitual drinkers, or mentally diseased, from entering matrimony. It is indeed remarkable that the State, which has vast numbers of compulsory means, does not make use of them in regard to this, particularly when we think how many millions could be saved in this way. The simplest thing would be to examine the blood for syphilis, by means of the Wassermann reaction, of every matrimonial candidate. A physical and a mental examination should also be made to find out whether we have to deal with an habitual drinker. Grave tuberculosis and malaria should also be excluded. It has been frequently found that the thyroid gland in newborn children of such parents shows grave degeneration, and we have already considered the great importance which the development of this organ has upon the mental and not less upon the physical well-being of the child in the future.

The signs of weakness of the thyroid gland are present in many such children, who also are retarded in their growth and in their physical and mental development. They become, very often, feeble-minded in a higher or lower degree (cretins). Their physical appearance we have already described. The causes for this congenital weakness of the thyroid are diseases of the parents which act unfavorably upon the offspring, such as syphilis, alcohol, tuberculosis, and various infectious diseases in general; also some diseases of metabolism and sexual excesses.

Such children are predestined to feeble-mindedness, if they are not already cretins or idiots. If they should happen to contract any of the infectious diseases frequently occurring in children a total mental ruin rapidly develops.

Fortunately we do not lack remedies to prevent such fatal development. Such children urgently need thyroid treatment. It should be started with very small doses and continued as it

is described in Chapter IV. Many feeble-minded children, who are either born as such or have developed the condition during childhood, originate from mentally diseased parents. This origin plays a very great rôle as the cause of mental diseases, as can be seen from the fact that almost every third case of mental disease is due to this cause. It either sets in during childhood or is developed later in consequence of the action of one of the favoring causes, which we will describe later.

According to Mott's investigations, mental diseases in children manifest themselves at an earlier age than in their parents. When, therefore, children have reached a certain stage of development they have a chance to escape the terrible fate threatening them, and their chances improve with advancement of their age. Daughters are much more threatened than sons. In general the chances are the better the older the parents were when they became mentally diseased.

The raising of such children, physically as well as mentally, demands particular care. All directions for leading a healthy life—which I have given in my book "Old Age"—would have to be followed. Particularly, everything has to be done to prevent as much as possible in such hereditarily predisposed children the development of infectious diseases, because such diseases may have a very bad effect on the ductless glands, particularly on the thyroid, and this may retard the mental development and bring about feeble-mindedness. It is very difficult to point out certain rules for that purpose, because we constantly, day and night, introduce into our systems millions of injurious bacteria, either with the air or with the food. We are able, however, to use prevention, either by increasing the resisting power of our bodies by hygienic modes of living, by inhaling plenty of pure air, by proper nourishment, etc.; or, on the other hand, also by avoiding as much as possible such localities in which the quantity of bacteria is increasing manifold above normal, such as rooms overheated with steam or impregnated with smoke, and where hundreds and thousands of people gather together. The

dark dwellings in cities, wherein the sun never penetrates, are frequently the breeding places for bacteria, and are particularly inappropriate places for children of mentally diseased parents. Most particular attention should be paid to the regulating of the diet. Growing children who are still studying must, in the first place, receive sufficient quantities of nourishment, particularly of substances which are rich in albumin, phosphorus and calcium salts. Badly nourished children are, as a rule, most easily apt to become victims of tuberculosis as the result of insufficient nourishment, as I pointed out in the chapter on "Tuberculosis" in my book on "Rational Diet." Just as it is for the body, so is insufficient nourishment also injurious for the mind, possibly even in a still higher degree. The desire to study thus meets with difficulties right at its beginning, and in the hereditarily predisposed, if compulsory means should be employed, mental diseases may very easily break out.

A very dangerous period for such children is the time of the beginning of puberty. Very often in boys, and still more in girls, as we have mentioned heretofore, psychical disturbances make their appearance, such as attacks of melancholia, suicidal ideas, wandering inclinations. From young girls we can often hear the expression, "How beautiful it would be to die." Just because in girls the inheritance of mental diseases is, as already mentioned, much more frequent, we must pay particular attention to them. Because of the fact that such girls so often have a congenital weakness of the ovaries, an ovarian insufficiency, disturbances of menstruation, dysmenorrhœa or amenorrhœa occurs very often among them. And when they get married, then their real troubles just begin. In the first place, many of them, on account of the weak ovaries, have no children, or, in case they do have children, pregnancy and also delivery and lactation expose them to many miseries. Not rarely after conception a vomiting which cannot be stopped takes place; and in further course, disturbances of the mind—psychoses of pregnancy—occur, and the same may also be found after delivery.

When such troubles occur, particularly in women with hereditary predisposition to mental diseases, every time after conception the question may justly be raised whether an abortion would not be indicated. This is particularly the case when, on account of the form of the pelvis or for other reasons, a difficult delivery may be predicted. In view of the fact, moreover, that under the circumstances the outbreak of mental disease is particularly threatening, and, even at best, the prognosis for the physical as well as the mental conditions of the newborn is not a good one, a gynecologist should be consulted in regard to the advisability of inducing an abortion, the same as is practised in case of heart diseases. Generally, such women should be kept under control of a gynecologist; also girls having any kind of disease of the sexual organs, as these are very frequently the seat of origin of mental diseases, particularly of "dementia præcox" so frequently occurring among younger subjects. We have already stated that in women, as well as in men, suffering from dementia præcox there may be found undeveloped or otherwise changed sexual organs, and also imperfect development of secondary sexual characters, as the breasts, the beard, etc. According to my own observations treatment with tablets of ovarian substance and the simultaneous use of thyroid tablets may be combined in cases of continuous vomiting in women; also in sterility, and in absence of menstruation due to weakness of the ovaries. Similar results have been reported by others.

Anemia and chlorosis, so often found in women, are very often due to weakness of the ovaries, as has been stated by von Noorden¹ and others. Now we know that anemia may not rarely give origin to mental diseases by being the cause of insufficient blood-supply to the brain-cortex. Therefore, as soon as the first symptoms of anemia become noticeable in girls with a hereditary predisposition to mental diseases, they must be fed abundantly with food containing iron. The best way to admin-

¹ Lorand, *Old Age*, on the influence of the ovaries and blood-formation and of the administration of iron,

ister iron and arsenic would be in form of mineral waters containing iron and arsenic. Often these individuals are very weak, and it is, therefore, indicated that these remedies be administered before the symptoms of anemia appear, in order to prevent the latter.

In the offspring of mentally diseased, as well as nervous, hysterical parents there is often found a very strong sexual instinct. Onanism is commonly found among them, and in view of the fact that too much of the latter is very injurious in such children and may pave the way to mental diseases, appropriate treatment for it should be instituted.

Blood congestion to the pelvic organs, caused by constipation, leads not rarely to diseases of these organs. Constipation should, therefore, be avoided, not only on account of that, but also on account of the pernicious influence of the poisonous substances which find their way into the blood and have a toxic effect upon the brain-centers. Daily evacuations must become the custom in childhood, because even in adults who are predisposed to mental diseases, constipation may lead to very bad consequences. In adults sometimes a state of confusion may be found due to obstinate constipation.

The spiritual and mental sides in the education must particularly be taken into consideration. Children of mentally diseased and also of nervous parents, of neurasthenics and hysterics are, as a rule, also nervous. Nothing could be more harmful than to make these children more nervous by threatened punishment. As it has been mentioned repeatedly in this book, nothing develops neurasthenia so quickly as fear and anxiety in regard to coming dangers. If neurasthenia and hysteria, to which children are generally predisposed, once become manifest, then, for children who are predisposed by heredity, the chances to become mentally diseased would rapidly increase.

It has been observed in many cases that children who had been threatened by their nurses with devils or the policeman, and who were badly frightened, suddenly became mentally dis-

eased, or became afflicted with epilepsy or convulsions. Similarly first epileptic attacks in children have been caused, for instance, by suddenly directing a stream of cold water toward them from behind.

Threats of punishment or actual punishment of such children in schools should therefore be studiously avoided. It is better to bring them up privately in their homes under strong parental supervision, and in this way also prevent them from coming in contact with bad influences of schoolmates. It must be continually kept in mind that such children are more prone to imitate bad examples than would those of stronger mentality.

Nothing could be more injurious than to overburden such children in school. Usually in these hereditarily predisposed young men, for whom mental strain is particularly harmful, mental diseases manifest themselves before examinations. It would also be a mistake to educate them for a career which taxes the nervous system too much, such as that of a diplomat, judge, physician, lawyer, or any occupation which puts too great a strain on the nervous vitality. The best career for a person of this kind would be in a private employment, where the work is the same every day, and nothing exciting would be likely to occur; and where, at the same time, the responsibilities would not weigh upon him as in the case, for instance, of an officer compelled to perform faithfully the duties of his position, or that of a judge.

Also in adults, in whose progenitors mental diseases have been known to occur, sudden attacks of mental disease, after great mental excitement, are not at all rare. Of course, the prospects are much brighter for adults to escape a fate of this kind than for those of more youthful years. If they have passed the perilous period of puberty and school graduation safely, the prospects for a happy future improve day by day. Nevertheless, in the years to come they have to learn to avoid not only mental excitement, but also the influence of toxic products of metabolism. Such products, especially uric acid and

sugar, may, in individuals predisposed to it, cause, as has been mentioned, an outbreak of mental disease. First of all they have to avoid infection with syphilis, as they are strongly threatened with progressive paralysis or tabes. They must further avoid alcohol; if this is harmful in adults it is still more so in children, and especially in those who are predisposed by heredity.

Children should never be given alcohol; only beer can be given to youths in case they have a desire for it, but only in small quantities. Even then the danger still remains that such hereditarily predisposed may not be able to control themselves and withstand the temptations to excess.

Alcohol in any form is for such individuals a poison. Also in regard to other excitants, as coffee, tea, tobacco, caution in such individuals is indicated.

Sexual excesses are deleterious to the offspring of the mentally diseased. Early marriage is therefore beneficial. Marriage with relatives must, however, always be excluded, except with distant relatives in whose families mental diseases have never occurred. In such marriages it may also be taken into consideration, whether the mental disease in the parents or grandparents was manifest before the child was born or after; also the nature of the disease is to be considered. If the parents have, for instance, acquired syphilis after the child was born and have developed paralytic insanity ten to twenty years later, the question of heredity is naturally out of consideration. It is also well understood that mental diseases caused by arteriosclerosis are of no significance for the offspring. This is entirely different with mental diseases which have already occurred during youth,—for example, epilepsy.

Of great importance for children of the mentally diseased is the regulation of their sleep. Insomnia must be combated with all available means, as this promotes neurasthenia and hysteria, and aggravates their symptoms. It is assumed that through long-continued insomnia very often there is an outbreak of mental disease even in those not hereditarily predisposed. A

mining engineer of 40 years of age related to me that once, after he had not slept for four nights, and also previous to that time had had to get up at 2 or 3 o'clock in the morning to overlook the shaft, he arrived at such a stage of exaltation that he was put in an insane asylum, and remained there for three years. Eating, smoking, and also drinking, to a certain extent, had something to do with it. Hereditary disposition was denied. It has to be taken into consideration that in children mentally diseased the road to insanity leads through neurasthenia and hysteria. First, the latter are acquired, and then, under circumstances which favor it, mental disease may develop. We have, however, thank God, the means to prevent the latter in most instances by guiding the education of these offspring in an intelligent way and using hygienic and therapeutic measures such as described in this and Chapter IV. As stated, it is necessary, besides other preventive measures, to prevent and combat insomnia with the means mentioned in Chapter III. The best results are obtained by daily physical exercises, frequent walks, trips, moderation in mental work, etc.

If, nevertheless, certain suspicious mental symptoms should become manifest, much harm can be prevented by institution of appropriate treatment at once. First of all, stopping of all work, particularly mental, must be demanded. It is true that in some mental diseases it is very difficult to make a diagnosis at its beginning, and it can be made only after careful observation; it is easier to make the diagnosis, however, when hereditary predisposition is established.

Those who are not hereditarily predisposed to mental diseases and had no accidents during birth, and also had no disease of the brain or of its membranes, may acquire mental diseases through the following two causes: (1) syphilis; (2) alcohol. If they become infected with syphilis, then, even if they are apparently cured by the use of salvarsan or mercury or iodine, or by the combination of all, it is necessary that the above-mentioned conditions, which favor the development of

mental diseases, should be avoided, particularly the use of the strong alcoholic drinks. Nothing can produce mental disturbance so easily, even in one not hereditarily predisposed, as the combination of these two main factors. The most dreadful mental disease may then break out, paralytic insanity; also a whole number of other mental diseases may develop in consequence of it. Either syphilis or alcohol, alone, is very liable to cause disturbance of mental faculties, by producing changes in the blood-vessels of the brain. Both belong to the most frequent causes of insanity; but when they act together the potency of the consequence is so much greater. It is still more certain in cases where deficient or irrational feeding, sexual excesses, mental shock, add their heavy weight on the scale. Without such causes, mental disease hardly ever develops in those not predisposed by heredity. Almost always it results as a consequence of great errors or negligence in the mode of living, due to the faults of the individual himself or more or less distant progenitors.

CHAPTER XIV.

THE INFLUENCE OF ALCOHOL UPON THE MENTAL FACULTIES.

THE dreadful scourge of mankind is alcohol, the worthy brother of syphilis. It is the accomplice of the horrible plague, as it prepares the soil, by undermining the natural human resisting power. If an individual is once affected by the disease, then it is mainly the indulgence of alcohol which makes a cure difficult or impossible. The unfortunates are then so much more liable to become the victims of the dreadful sequelæ of the ruin of mind and body caused by syphilis, softening of the brain and tabes.

The great significance of alcohol in paving the way for mental diseases can be seen from the fact that a great many of the inmates of insane asylums recruit from the sphere of drunkards. In some large cities, as in Berlin, for example, almost half of the cases of insanity can be credited to the use of alcohol. According to E. Meyer,¹ 20 to 30 per cent. of all cases admitted to insane asylums in Prussia are produced by alcohol. In visiting various insane asylums I have found it confirmed that a considerable number of the inmates manifest signs of diseases consequent on alcohol use, or that the alcohol was co-operative in the development of insanity. The most horrible collection of this kind I found in France, where absinthe, that most dreadful mind destroyer, was the cause.

A most effective way to keep men from developing the alcohol habit would probably be the use of a most horrifying remedy by taking the would-be victims around the wards of insane asylums and showing them the cases which are directly or indirectly due to the use of alcohol. The thing that is still more terrible is, that not only the drunkard himself has to atone

¹ E. Meyer, *Die Ursachen der Geisteskrankheit*, Jena, 1907.

for it, but his children too must suffer, and some of them may also be found in asylums in which their fathers have been inmates. High-grade idiots, feeble-minded of various forms, epileptics,—they all, or the most of them, can accuse their alcoholic or syphilitic fathers or mothers for bringing them into the world to be a burden to themselves and to their fellow-men. Their support during decades is an expense of millions to the State, and what forms not the least offense to abstainers and anti-alcoholics is that they have to supply the necessary money to pay the tax for the support of the children of the drunkards who are unable to support themselves. And even in case the children of the drunkards are born apparently healthy in mind and body, they already inherit the drinking desire, as proved in the great majority of cases. Under the influence of their surroundings, naturally almost in every case a new drunkard is again created, and thus the vicious circle continues. In such families, then, alcohol, syphilis, and various other vices naturally join hands; and the insane asylums, prisons, hospitals, homes for incurables at last become their homes and resting-places in their declining days.

I have already emphasized in my previous writings² that the normal man does not drink above his thirst, and that the drunkard also does not drink because he finds particular pleasure in it, but because he has an impulse for it, an unconquerable, morbid desire for it which can best be expressed in the English word "craving." The foundation which causes that impulse is already a morbid manifestation in the body, as it is found most frequently in depressed conditions of persons suffering from inactivity of the thyroid gland, myxedema or related forms. They are always in bad humor, as is the case with many epileptics, and the next nearest consequence naturally is that they take to drink. The children of such patients are born also, as a rule, with a deficiency in the development of the thyroid gland, and

²Lorand, *Old Age*, chapter: Causes of Alcoholism.

thus we can explain the hereditary disposition of the alcoholics. I want to call attention particularly to the quantity of alcohol which individuals suffering from weakness of the thyroid gland can stand, frequently even delicate women, and this naturally increases the desire for it. By the fact that alcoholics have children with degenerated thyroid gland, the thought that there is a close connection between alcoholism and myxedema becomes more probable; the former makes a most fruitful soil for the latter. It attacks the thyroid, as is shown by the investigation of Quervain and Aeschbacher, and causes its degeneration; and this in its turn is inherited by the offspring, the same as all degenerative changes of the ductless glands are, as has been repeatedly mentioned, transmitted by inheritance. This, therefore, explains the heredity of thyroid degeneration and, based upon it, also of the alcoholism.

Now, if alcohol causes the destruction of the thyroid, changes of the mental faculties must also naturally follow. Such changes often develop only years after the action of the alcohol has continually taken place, the same as other diseases which develop on the basis of thyroid degenerations become manifest only after years. It is quite natural that the alcohol acts directly upon the brain-cortex similarly to other toxic substances, namely, by affecting the nerve-cells of the cortex. Grave disturbances of mind become, however, manifest only years later, probably through disturbances of metabolism caused by deficiency of thyroid activity.

Whether alcohol is used occasionally or regularly in large quantities, it will always affect the mentality. This is particularly clear during intoxication. Depending on the resisting power of the central nervous system of the various individuals, intoxication may be produced by smaller or larger quantities of alcohol. But even when alcohol is taken only in small quantities, and even only occasionally, it is certain that, according to the investigation of Kraepelin and his collaborators, in such instances also mental faculties may suffer; this is seen from the

less favorable results given by the experiments with time reaction. I want to mention particularly that alcohol, even in small quantities and only in form of wine, may reduce in many individuals the fineness in the perceptive power of the senses. I, therefore, consider it better for mental workers to refrain from the use of alcohol as much as possible. It may stimulate fancy, but positively affects the power of criticism by reducing the acuteness of the senses. If in my previous writings I had no reason to prohibit the occasional use of wine or beer in small quantities, which brought me many reproaches from anti-alcoholics, I do not hesitate to express my opinion here, that in mental work, particularly when it concerns the perception of delicate differences, even small quantities of alcohol may be embarrassing.

For school-children the use of alcohol must be by all means prohibited. A child is much more susceptible to alcohol than the adult, because its ductless glands, which have an antitoxic effect, are not yet developed. Their development takes place only during puberty, and it is, therefore, not surprising that children who partake of alcohol at all, even when not daily, become backward in school, as is seen from various school statistics. The last report of the school physicians in Berlin show that of the children who have received unsatisfactory marks in school, 24.9 per cent. boys and 8.3 per cent. girls never or only rarely received alcohol; of those who received whisky once a week, 31.1 per cent. boys and 16.5 per cent. girls had bad marks, and of those who received whisky daily 60.5 per cent. boys and 55 per cent. girls had marks below the required standard.

Bayr's investigations of 591 school-children in Vienna revealed that of 134 not drinking, only 12 (9 per cent.) had low marks; 164, occasional, 15 (9.1 per cent.) had low marks; 219, beer once daily, 39 (13 per cent.) had low marks; 71, beer twice daily, 13 (18 per cent.) had low marks; 3, beer thrice daily, 2 (66 per cent.) had low marks.

In the *Beiträge zur Kinderfürsorge und Heilerziehung*,

published by Trüper, in Jena, are reported cases by Schauer of children, capable and even talented from birth, who have manifested lasting and grave injuries to their mental faculties alone caused by the use of alcohol. He reports a case of a 6-year-old boy, who was very bright and who had remarkable judgment and ability. After a while he became very easily tired, his attention became reduced to an abnormal degree, and his written home work became entirely useless. It was found that the boy, whose father was a coachman, received whisky daily from his colleagues, and in this way the formerly very bright boy was ruined entirely. Schauer observed in such children an impulsive craving for alcohol and all manifested feeble-mindedness.

Often children of the lower classes receive whisky from their fathers, and this may not only kill the good qualities which may be present originally and develop worse ones instead, but by its deleterious effect upon the thyroid gland, the sexual glands, the liver and kidneys, it ruins them also physically, and by also injuring the bony structure causes them to be backward in their growth. If there is a hereditary disposition to epilepsy, feeble-mindedness, etc., in such children it is made more potent, and such diseases, if they are already present, become more aggravated. According to experiments of Laitinen, immunity through the use of alcohol is reduced, and such children become susceptible in a very high degree to all infectious diseases.

In view of crimes of this nature so often committed on children, either by their fathers or mothers, or other adults, the question naturally arises whether a law should not be enacted which, under heavy penalty, would prohibit the giving of alcohol to children, particularly in the form of whisky. It would indeed suffice if in these cases the laws against assault and battery should be applied, as it unquestionably embraces the intentional injury of the health of the children. It would be most rational if children, whose parents are habitual drunkards and have already been punished for drunkenness, should be taken away from their parents and brought up in orphans'

homes. Should the State consent to that it would best profit by it, as it would bring up useful citizens, fit soldiers, and would save every dollar spent at present on hospitals, insane asylums and penitentiaries. Parents who are habitual drunkards and burglars have deprived themselves of the right to own and dispose of their own children, and they should not be permitted to drive their children into certain misery, and deliver them to insane asylums and hospitals or jails. Here, again, I take the opportunity, as I have done in my other writings, to call attention to the fact that we have sufficient prohibition laws already, but what we urgently need is a number of preventive measures and laws. Such laws partly exist in England, and in some of the American States. Those who are unworthy of propagation are castrated, fortunately, before they have had a chance to become parents.

Although the consequences of the use of alcohol are not as bad in adults as they are in children, unless in the case of great drunkards, yet in many individuals, according to Kraepelin,³ disturbance of the mental faculties takes place by continuous use of 80-100 Gm. alcoholic beverages daily.

Kraepelin has also shown that often, after giving up the use of alcohol entirely, even when only small quantities have previously been taken, a marked increase of mentality takes place; while in individuals who for years have consumed alcohol daily in no small quantities, there can be noticed after some time a considerable reduction of their mental faculties. Bonhoeffer⁴ also found in these individuals a condition of depression, such as is found, for instance, in epileptics; also stupidity in perception; soon they lose all initiative power and a complete fatigue sets in. In habitual drinkers, after a number of years, depending on the quantity of alcohol consumed, feeble-mindedness becomes manifest; they cannot perceive anything, comprehend everything badly; they are unable to concentrate their attention

³ Kraepelin, *Psychiatrie*, VIII Auflage, i. 1909, S. 88.

⁴ Kraepelin, *Psychiatrie*, VIII Auflage, i, 1909, S. 88.

on any special object; their memory becomes bad. Thus a condition of chronic alcoholism develops with a general reduction of all mental faculties, reaching gradually the higher degrees of feeble-mindedness. In brandy drinkers the highest degrees of mental disturbance develops, such as delirium tremens and the worst form of weak-mindedness,—Korsakow's mental disease. In beer drinkers, who consumed large quantities regularly, Kraepelin⁵ observed slowly developing mental stupidity, a regular down-and-out condition, as it were. In young girls and women whom I directed to drink two glasses of Bavarian beer daily for their anemia, feebleness and emaciation, I have frequently observed a marked sleepiness. In individuals who took daily a quantity of alcohol corresponding to two liters of beer, Smith observed a permanent reduction of their mental faculties after the second day. The experiments of Smith and Kurz have also shown that the effects of regular and continuous use of alcohol manifests itself very soon.

There are persons so silly as not to mind occasional intoxication, but a number of experiments have shown that the after-effects of such excesses are manifested in the mental sphere long afterward. So have Fürer and Rudi observed in various individuals a reduction of the mental faculties twelve, sometimes twenty-four hours, and even forty-eight hours after an intoxication. The after-effects of alcohol may be felt for quite a time after its use has been discontinued. Kraepelin found in one drinker a considerable reduction in conceptive power still present two weeks after the giving up of the habit. The experiments of Kurz and Kraepelin⁶ have distinctly shown that for full recovery of the drinker a total abstinence from alcohol is required.

The greatest injury to the mental faculties is produced, as already mentioned, by the use of brandy. It is significant that

⁵ Kraepelin, *Der Alkohol in München*, *Münchener mediz. Wochenschrift*, 1906.

⁶ Kurz und Kraepelin, *Ueber die Beeinflussung psychischer Vorgänge durch regelmässige Alkoholmengen*. *Psychologische Arbeiten*, iii, Heft 3.

in Southern countries where wine is drunk, as Italy and Spain, drunkenness is very seldom observed, and when it does occur it can be generally attributed to the use of whisky. In countries where beer is most used, it is the enormous quantities consumed which are the contributing cause of alcoholic insanity. At any rate, it would be entirely wrong to allow habitual drinkers the use of even small amounts of wine or beer. It is already due to the inferior mental disposition of such individuals that they are totally unable to limit themselves to the use of only small quantities. Children of habitual drinkers must abstain entirely from the use of alcohol, and it is best to begin in childhood before they have ever tasted it. There is one faculty which is particularly characteristic of individuals of impaired or inferior mentality, and that is lack of foresight. If anyone had an acute attack of intoxication and experienced the feeling, which is not unlike seasickness, and also the indisposition which follows it, it would be reasonable, from the standpoint of intelligence, to assume that such a person would be discouraged from having other attacks. The normally thinking, intelligent man is generally withheld from thoughtless acts by consideration of the possible consequences. This naturally cannot be expected from those with a low grade of intelligence, as the wild Australians, and from many of our drunkards. Therefore, as with children who have no thought for the future as yet, the use of alcohol by such individuals must be made as difficult as possible or entirely impossible. As a rule, we have to deal with an hereditary, morbid predisposition, because a normal child has rather an aversion for alcohol.

It would be very fitting to impress upon the minds of children in school by frequent repetitions, as is done with the multiplication table, the dangers of alcohol. This could be introduced in the public school readers, as is attempted, for instance, by the Pedagogic Society in Chemistry, which presents the injurious effects of alcohol, and also of tuberculosis, etc., in a very entertaining and interesting form of small essays. In this way what

is learned in youthful years remains in the memory forever. Descriptive essays should also be published about visits to the various expositions demonstrating the bad effects of alcohol.

Notwithstanding the high duty that is placed upon alcohol, it is of no avail! Particularly very heavy duty is put upon the production of brandy, and the State has a great annual income from it. But it is very questionable whether or no the State profits by it from the business standpoint, when it takes in a million with the left hand and spends with the right three millions to remedy the injuries produced by alcohol, not counting the waste of so much valuable human material and the poverty and misery produced by it in many families. Continually new inferior generations are brought up, and misery, illness and crime are spread. Would it not be appropriate to crush the head of the hydra, while there is time and opportunity? Similar to other mental disturbances, alcoholism has an underlying physical cause in the body. The craving for alcohol originates in all probability from a deficient activity of certain glands of internal secretion, which, as, for instance, the thyroid, dominate our metabolism, and thus also our frame of mind. In degenerative conditions of this gland the metabolism is diminished, there exists a sensation of cold, even in the summer, and mental depression is its characteristic feature. It is not more than natural that under such conditions a stimulation by alcohol is sought. The probable base for this view is found in the fact that children of alcoholics, who show the craving for alcohol in infancy, are born with a degenerated thyroid. And the latter also predisposes them to various mental diseases.⁷

The rational way for prevention of alcoholism would, therefore, consist in the first place in the care of the body. Influences of hunger and cold have to be avoided, sufficient nourishment and all hygienic modes of living, which further the thyroid activity, serve as preventives. Children of alcoholics should be given, during their first years of life, additional nourishment

⁷ For further information see also chapter VI, 9 von Lorand, Old Age.

containing iron and iodine; mainly milk, which, as mentioned before, contains secretions of the thyroid. Small quantities of thyroid tablets and small quantities of iodine would be very appropriate, from the fact that scrofulosis is so extraordinarily frequent in such cases. Of the same benefit is cod liver oil, which contains iodine. Alcohol, however, even a drop of it, is a poison for them.

CHAPTER XV.

INFLUENCE OF SLEEPINESS AND SLEEPLESSNESS AND ITS RATIONAL TREATMENT.

DURING sleep all conscious mental activity ceases. It is assumed by many that during sleep the blood-vessels of the brain-cortex become empty, and this, as mentioned before, excludes all conscious thinking. Before sleep sets in a sleepiness, and therefore a reduction of the blood-circulation in the cortex, takes place. This reduces the thinking ability, the attention is lowered, stimulation of the senses is not perceived, and thus sleep is much more accelerated. When stimulated by a brilliant light or loud sound attention is again awakened, the blood-circulation is revived, and thinking ability returns in its full freshness.

That a diminished blood influx to the brain favors sleepiness we may see from the fact that we observe this condition when any weakness or disturbance of blood formation or in the general circulation is present, and when the arterial blood-supply of the brain is more difficult. It takes place, for instance, after great losses of blood; also during convalescence from grave diseases associated with fever, and we also know that anemic and chlorotic girls and women need long sleep. We find it conspicuously as a very typical symptom in degenerative conditions of the thyroid, as, for instance, in myxedema. We have before mentioned that, according to Cyon's theory, the thyroid regulates the blood influx to the brain. At any rate, we see in myxedema indications pointing to a reduced general circulation. The skin is pale, the hands are often blue-red and cold, and the skin in general all over the body feels cold. There is such a feeling of cold in the course of this disease that some patients, as I observed in a French lady, put on furs during the hot sum-

mer days. The lowering of mental faculties in that condition we have already mentioned.

The African sleeping sickness is, according to my own experience which I reported at the Congress of Internal Medicine at Wiesbaden in 1905,¹ also closely related to myxedema. I had an opportunity to observe a Belgian officer of the Congo administration force suffering from that disease nine summers ago in Carlsbad and the winter following in Brussels. It struck me that the patient manifested all the symptoms of a myxedematous condition. He was at the same time so sleepy that he fell asleep even during meals. It is reported, moreover, of such patients that they fall asleep in all possible positions,—for instance, one officer of the Congo army fell asleep during his wedding; another one at the entry to his physician's office while he was ringing the bell. According to the microscopic sections which I demonstrated at the Congress of Internal Medicine (I had an opportunity in Brussels to study this question also from the standpoint of pathological anatomy) changes found in the central nervous system in the African sleeping sickness are similar to the changes found in myxedema. All these changes are undoubtedly the results of a preceding overactivity of the thyroid, the same as found in trypanosomiasis—disease caused by the sting of the tsetse fly. Myxedema, as we know, very frequently forms the end-stage of a preceding Basedow's disease, and in trypanosomiasis are actually found all typical symptoms of Basedow's disease, as it is found in all grave infectious diseases in general.

That the African sleeping disease is only a sequel, and may justly be attributed to changes of the thyroid gland as I suggested, may be deduced with certainty from the fact that an entirely similar condition is also not infrequently observed in our regions, namely, in cases where changes of the thyroid are present. We see it very distinctly in obesity. There is a form

¹ Lorand, Verhandlungen des Deutschen Kongresses für innere Medizin, 1905.

of obesity which, in my former publications, I called endogenous obesity,² because it originates, irrespective of overnourishment, from causes which are to be sought within the body itself, namely, from changes taking place in various ductless glands. In my book, "Old Age," I have reported several such cases, and will mention here only one of them. It was a Mr. L., from Paris, whose weight was 124 kilo, and who fell asleep at all possible opportunities. Patients who have been sitting in my waiting room often had to support him to prevent his falling from the chair. He would fall asleep while conversing with me. Once he was arrested by a watchman in Carlsbad because he fell asleep leaning against a railing at the Tepl River, and was held to be drunk; it is a condition similar to the one observed in the African sleeping disease. After I had treated this patient with thyroid tablets he lost 16 kilo in weight and simultaneously his condition of sleepiness was markedly improved. I should like to mention here that the patient presented signs of general circulatory disturbances. The hands were blue-red, somewhat swollen; the face showed a blue-red tint. The presence of a venous stasis has been revealed by the fact that when the patient developed a bronchial catarrh the sputum became bloody, without characteristic changes of pneumonia being present. In regard to the mental faculties, it may be stated that his thinking was retarded. It was always some time before I could get an answer to a question. His speech was very slow, memory somewhat weak. The logic of thinking was not affected, judgment not markedly weakened, but he exhibited somewhat of a peasant's mind. Taken as a whole his mental faculties were rather below the average of men of his standing. He was the son of a millionaire banker; he had received a good education, and lived as a rich, retired man, without any occupation. Considering his mental faculties as a whole, he could be characterized as a good-natured fellow. His mental horizon was, on the whole,

² Lorand, *Medizinische Klinik*, 1905.

very limited. A similar case of a boy affected with such a form of obesity with sleepiness, who fell asleep during instruction, is mentioned in another part of this book.

The best treatment for such a condition is, according to my observation, the administration of thyroid, which at the same time acts favorably upon the obesity. It is also advisable to recommend a sunny climate during the winter. That the latter gives good results we demonstrate by the case of the high-school boy affected with sleepiness, reported in Chapter IV. The influence of the sun is also proved by the fact that in beautiful summer the desire for sleeping is lessened; as soon as the fall comes sleep becomes longer, and in dark winter it is the longest. Frequent walks, carbonic acid baths, various sports are to be recommended, as they favor the blood-circulation.

Based upon my observation of the sleeping sickness I advanced the theory eight years ago³ that sleep is regulated by the thyroid gland. I pointed out the improvement obtained in the case of the African sleeping sickness which I have observed by the administration of thyroid tablets; and I also alluded further to the fact that whenever the thyroid is degenerated, sleepiness appears as a very typical symptom, as is the case in myxedema; whenever the thyroid is overactive, however, as, for instance, in Basedow's disease, there, contrary to myxedema, sleeplessness may be observed. Upon myself, as well as upon a number of patients, I confirmed the above statement by observing that when thyroid tablets have been taken to excess sleeplessness was produced.

Apparently without knowledge of my observations upon the influence of the thyroid, Salmon afterward advanced the view that the hypophysis regulates the sleep. He pointed out the presence of sleeplessness in the presence of tumors of the hypophysis. In regard to this I want to suggest that in these cases changes

³Lorand, *Das Wesen der Schlafkrankheit*, Deutscher Kongress für innere Medizin, Wiesbaden, 1905.

in the thyroid are always present, and they lead secondarily to the changes in the hypophysis.

We find, therefore, that the difference between the conditions of sleepiness and sleeplessness is, that in the former an underactivity of the thyroid manifests itself, while in the latter an overactivity is present; in the former the blood-supply to the brain-cortex is a more difficult one, while in the latter there is, in all probability, an overfullness of the blood-vessels present. In this connection I would like to point out that all the conditions and all remedies, which produce a rich blood-supply to the cortex, also produce sleeplessness. So, for instance, coffee and tea raise the blood-pressure and widen the blood-vessels of the brain. An opposite action is produced by the sleep-producing remedies, as morphia, for example. Here the blood-pressure is lowered and the blood-vessels of the cortex are contracted. In conditions of maniacal exaltations, insomnia also takes place, possibly as a result of a congestion to the brain-cortex. Usually in such exalted conditions, sleep-producing remedies are therefore used.

We know that during the process of thinking much blood is supplied to the cortex. If anyone works mentally in the evening before going to bed and then thinks about it while in bed, there can be no quiet sleep. Those suffering from insomnia should, therefore, do no mental work at night. This would be the simplest hygienic advice. It is a great mistake when anyone suffering from insomnia at once takes refuge in hypnotic remedies instead of trying the simple hygienic countermeasures already dictated to us by healthy common sense. What is the sense of taking at once veronal, and at the same time permitting the electric light from the street to shine into the bedroom, or sleeping in a room facing the street where the noise from the cars and other rattling transportation facilities are constantly heard? The proper thing to do is to exclude all irritations of the organs of sense, and, with them, of the brain-cortex, by closing all the windows hermetically with double frames and selecting

as a bedroom one facing a garden. The windows must be provided with blinds or thick blue or red curtains to avoid as much as possible all perceptions of light and sound. Such excitements of the brain may, however, also be caused by other internal disorders, such as a full stomach when in the evening food which is difficult to digest and causes annoying flatulence is eaten, and also fullness of the bladder when drinks are used containing carbonic acid or alcohol. Alcohol can also cause an overfilling of the blood-vessels of the brain, and in this way disturb the sleep. About all these various causes of insomnia and their remedies I have dwelt in detail in my book on "Old Age," and need not, therefore, repeat it here.

Whereas sleepiness injures the thinking ability very materially we may observe not rarely, during insomnia due to the rich blood-supply to the blood-vessels of the brain, an elevation of thinking power, which is still more increased by the horizontal position in bed. And thus it is not to be wondered at, that world-moving discoveries, some of the greatest mental creations, have originated during a sleepless night. As an example I may mention here the discovery of the telegraph. Morse, to whom we are indebted for that discovery, was on the high seas returning home from England. One night a storm arose and Morse could not sleep. He was constantly thinking of the power of electricity, and suddenly an idea came to him to utilize it for distance writing, and he was reflecting upon the best method to put his thoughts into practice. He at once jumped out of bed and, awakening his cabinmate with the exclamation, "God has sent me an idea which will astound the world," drew the apparatus as it had presented itself to him in his mind. Some time after the first telegraph line was opened between Washington and Baltimore.

We find insomnia also very frequently in men of very high standing in regard to mentality, and in brain-workers generally. If it continues for a long time it may have an unfavorable influence upon the thinking ability, because a condition of fatigue

may ensue and as a consequence the various sense-perceptions which constitute the base of our thinking are not understood and applied correctly. It has also to be taken into consideration that sleeplessness may form the cause for origin of neurasthenia and grave nervous diseases, which, in their turn, may affect the thinking faculty, and even favor the development of mental diseases. We must keep in mind that sleep is a process of detoxication, whereby a number of injurious substances are eliminated. We are then able to understand that by the retention of toxic substances mental diseases may be caused. It is, therefore, perfectly proper to administer codeine, or $\frac{1}{2}$ to 1 gramme of veronal, or the milder-acting bromural, in case sleep was insufficient, two or three nights in succession.

According to my observations, which I reported in my book on "Old Age," the serum of decapitated goats, the antithyroidin of Moebius, which was used on his recommendation in Basedow's disease, acts also very favorably in insomnia. By prompt treatment of insomnia, an already approaching mental disturbance may not rarely be successfully checked.

A very effective remedy against insomnia is often early rising, at 5 o'clock, or, still better, at 4 o'clock in summer and 5 or 6 o'clock in winter. One feels then so sleepy at about 10.30 in the evening as to sink into rest at once. Thus is produced the best remedy against insomnia, namely, sleepiness. From 4 or 5 until 8 o'clock in the morning, according to my own experience of many years' standing, a great amount of work may be accomplished with clearness of mind, and a sleep of six or seven hours is sufficient for a mental worker. Of course, the sleep must then be a very deep one. The necessary duration of sleep depends, in my mind, more upon its depth than upon its length. A sleep too long is surely more detrimental for mental activity than one that is too short. The following old Flemish proverb, about the duration of sleep, is therefore very true:—

"Seven hours' sleep is Christian,
Eight hours' sleep is human,
Nine hours' sleep is beastly."

CHAPTER XVI.

THE INFLUENCE OF MIGRAINE AND HEADACHES IN GENERAL UPON THE FACULTY OF THINKING AND THEIR RATIONAL TREATMENT.

WHOEVER has had the opportunity to observe a person suffering from most severe headache, as it is generally manifested during an attack of genuine migraine, would easily understand that in such a condition any kind of thinking is absolutely impossible. How could it be possible for a man to think at all, and still more do any kind of mental work, when the slightest sense perception, even a glimpse of light or the lowest sound irritates him and aggravates his condition? Such a man shuns the light; he instinctively looks for the darkest room, and by darkening the bedroom during the day and closing the windows and shutters he tries to exclude all rays of light and all sounds. He wants to quiet down his brain by excluding all sense perceptions. It seems to be a fact that in this condition an irritability of the brain-centers toward sense-perception exists which, it is assumed by many, is caused by a disturbance of the blood-circulation in the cortex of one hemisphere. This is probably also indicated by the frequently appearing scintillating scotomas. In this case one sees a flashing, zigzag line on one side of the field of vision. Before this appears, however, there are for 5 or 10 minutes previous to that some forerunners. First, the patient notices that a certain part of the field of vision becomes indistinct, as if covered by a cloud. He can recognize only parts of an object, but not the whole object distinctly. Then, a few minutes later a crown of rays which, at the outer border of the field of vision, moves in different directions, but usually from above downward, like a glimmering whip, short in the beginning and becoming continually longer. In about half an hour everything is over. According to my observation such a scotoma

most easily develops when the patient strenuously performs some mental work, and at the same time keeps his eyes fixed for a long time on certain points which he reads, whereby the eyes are kept converging. This causes a congestion of the eyes. As a circulatory disturbance in the cortex must also be considered the total blindness of the entire or only half of the field of vision (hemianopia). It is to be attributed to a disturbance of circulation in the hind lobe of the opposite half of the brain. The participation of the brain is, moreover, seen from the occurring disturbance of thinking ability; it may even become a confusion, the same as is seen in mental diseases.

It is probably in connection with a beginning congestion to the brain-cortex that nearly half of the patients suffering from migraine, shortly before the attack, feel, so to say, "devilish"; well, they are mentally active in a great degree. This mental incitement should, according to what has been suggested in Chapter I of this book, be attributed to a profuse filling of the brain-cortex with blood which introduces the attack.

That a profuse blood-supply to the brain-cortex produces a better disposition and incitement for mental activity we have before mentioned; a stagnation of it, however, may favor the formation of a congestion. Such a congestion is liable to cause headache. In the article which was published in *Münch. mediz. Wochenschrift* on October 3, 1912, I have attributed to this cause, not only the origin of migraine, but of headaches in general. Anyone who is engaged intensely in mental work may have some time a congestion of the brain associated with severe headache. This may cause severe nasal bleeding,—something which is not very rare in such cases,—and the headache will then, as a rule, disappear. The latter may be attributed to the fact that the blood-circulatory condition has been relieved by the bleeding and the stagnation of the blood in the brain-vessels has diminished. In old subjects suffering from arteriosclerosis, who so often complain of dizziness and unbearable headaches, we can observe a marked improvement or disappearance of the

headache after a spontaneous nose-bleeding, and in connection with it the previously existing reduction of the mental faculties are raised, and with it the thinking ability in general.

In view of this fact it would be advisable in case of headaches, particularly when they are most violent and unbearable, to produce such a bleeding, provided there are no other contraindications to it. When we want to relieve the circulation we do not need, however, to resort to such bloody measures as venesection. The venesection, which was one of the main therapeutic preventive measures during former centuries, is at this time entirely abandoned, although it is questionable whether justly. Instead of that we use at present mustard plasters; we order strong purgatives, and produce profuse sweating; we also influence urination, which, although indirectly, also relieves the blood-circulation. A similar indirect method through the nose we can also use, according to my experience, by administering sneezing powders, which results in a profuse nasal discharge. The amount of fluid secretion which is discharged is, as already mentioned, mainly withdrawn from the blood and lymph, and as a result there can be noticed, as a rule, a decided improvement; very frequently even an entire disappearance of the headache.

In a number of instances, in myself and also in patients suffering from headache during colds in the head, with dryness in the nose and scab formation, or in obstruction of the nasal chambers, I have used a sneeze-producing snuff consisting of sneezing root, marjoram, and Florentine root. After the sneezing the disagreeable dry feeling disappeared, and with it the headache was also gone. A similar effect I was able to produce by the smelling of ammonia or mustard spirit, which also produces a discharge from the nose. Taking into consideration the conditions existing in migraine, I explained the effect obtained by this treatment as due to the relief of the blood-circulation in the brain, and have obtained, likewise, favorable results in cases of migraine in quite a number of patients. In most severe attacks

it acted at once as soon as sneezing took place, and secretion was discharged in large quantities. So I treated, for instance, in this way a lady superintendent of a large bakery in Carlsbad who had been suffering for a number years from unbearable migraine pains. Every time that she had a migraine attack she took this sneezing powder, and a few minutes after the sneezing started the headaches disappeared. I was very much annoyed once by severe pains in the right side of the head. The smelling of ammonia relieved the headache, but it soon returned. I then took a sneezing or snuff powder which contained a small quantity of veratrine. A very profuse discharge from the nose set in; enough to wet two handkerchiefs, and the headache disappeared. Veratrine is, however, even in small quantities, not a harmless remedy, and, therefore, the more harmless sneezing root in 3 or 4 per cent. strength is to be recommended as an addition to a snuff powder. If that sneezing powder is not used too often, it is, according to my experience, harmless in a large number of cases.

The favorable results which I have obtained with sneezing powder in treating headaches due to migraine and nasal obstructions have induced me to try this method also in other kinds of headaches. And there, also, I have obtained equally good results, so in headaches due to neurasthenia, in two cases of indisposition after intoxication with champagne; even in headaches during angina a marked improvement took place; also in two cases of trigeminal neuralgia due to disease of the teeth. Very interesting was the observation which I made once during my journey from Calais to Dover; on a very stormy day I had used ammonia as an inhalant and produced sneezing with a snuff powder. While I felt somewhat seasick, I felt no headache at all. When the steamer entered the harbor I had quite a severe vomiting spell whenever I wanted to move, but during the whole journey I had no headache. Other times I was always seasick on the water, and always had headaches associated with it.

All these cures and remarkable improvement of headaches of various kinds have always taken place after sneezing and profuse discharge has set in, which is an indication that the nasal discharge has acted as a relief for the blood-circulation in the brain. It is my opinion that all headaches have the same origin or starting-point, and have the same cause, which is to be looked for in the circulatory disturbances of the brain, either in the cortex or, in view of the fact that the blood from the cortex passes through the veins of the brain into the dura mater, in the blood-vessels of the latter. These blood-vessels, as I have already mentioned, enter into relation by means of the sinus, the veins of Santorini, diploic veins, and the veins of the nose. The rational treatment of headaches is, therefore, in my opinion, based upon utilizing these anatomic relations for therapeutic purposes. From this point of view it is also easy to understand how the navy physician, Michael Braun, the founder of vibration massage of the nose and pharynx, was able to remove the severest headaches in malaria as well as neuralgia by means of nasal massage. It also explains the reason why headaches in brain-tumors may be treated with such favorable results with large doses of iodine. These methods of treatment just depend on the utilization of the nose as the organ of compensation, for the circulation is in the brain.

I consider this external method of treatment of headaches as very rational. It is decidedly more harmless than the salicylates, phenacetin, antipyrin, pyramidin, etc., which are not harmless for the stomach, heart and kidneys. Taken often these remedies are surely not without danger for the named organs, and in some cases even when they are taken more rarely. But the sneezing powders may also sometimes act unfavorably, for instance, in arteriosclerosis, by increasing the pressure, although after profuse nasal discharge sets in the pressure becomes at once reduced. In habitual headaches the most rational treatment is massage treatment of the nose by an efficient specialist.

In severe cases of migraine it may be noticed sometimes,

not only during an attack, but also in the intervals, a reduction of mental faculties, particularly in migraine of the eyes. The fear for the next attack alone acts in a depressing manner and distracts the attention from mental work. It happens, however, that some highly gifted individuals may produce very important work, notwithstanding terrible eye migraines. This we see, for instance, in Wollaston, and also in Nietzsche. In both it was an omen of the approaching mental disease, the progressive paralysis in which eye migraine, like as sometimes in tabes, may be the very first symptom of the disease. In many individuals suffering from severe migraines, the memory becomes first of all affected. This is the result of absent-mindedness, the weak perceptibility. According to Flatau¹ most often names are forgotten, even those of distinguished men or generally known authors, titles of books; also, foreign languages. He treated an elderly lady who was so forgetful that she could not attend to her household duties; she did not know where she shortly before had put her keys, or what orders she had given a few minutes before to the cook. This lady had no psychical disorder whatever. Another of his patients, a lady 28 years old, forgot the number of the house where she lived.

That in individuals suffering from frequent severe migraine attacks, particularly eye migraine, the general disposition becomes affected is quite obvious; also that the depressive conditions have a very unfavorable influence upon mental activity. Sometimes it may advance so far as to give rise to mental disorders. It has been mentioned before that the most disagreeable cases of migraine, the eye migraine associated with scintillating scotoma, are sometimes the forerunners of approaching mental disorders, of the paralysis of the insane. These may appear many years before the outbreak of the disease. If a person, who never suffered from migraine before, becomes affected with eye migraine at an advanced age, it is often an

¹ Flatau, *Die Migräne*, Berlin, 1912.

unfavorable sign. It may have some relation to arteriosclerosis or it may have something to do with vascular changes in the brain; more often, however, it may be considered as a forerunner of developing progressive paralysis or tabes, in case sometime, or even years previous, a syphilitic infection has taken place. Some authorities consider as the cause of migraine a spasmodic contraction of brain-vessels, particularly of the art. fossæ sylvii or art. cerebri post.

This contraction causes a temporary disturbance of circulation in the brain-cortex. Sieble² is of the opinion that some chemical toxic injury causes a reaction in the cells of the cortex which produces the glittering and also the zigzag rays; after the reaction is over, exhaustion and paralysis set in, which is followed by the appearance of the dark spots, the scotoma; then follows recuperation of the cells, and the sight is restored to its former strength.

The treatment of migraine is, therefore, to be directed against these toxic injuries. These may be of different kinds. Uric acid is considered by many as the most important of such injurious substances. Wherever there exists a uric acid diathesis—and such is found in most of the cases—a corresponding diet must be observed. All foodstuffs which form much uric acid should be strongly avoided. I have given a list of uric acid-forming foodstuffs in my book on "Rational Diet" according to the investigation of Bessau and Schmidt. Here I want to mention only that calves' sweetbread, liver and kidney form most of the uric acid; meat in general, also legumes; some varieties of small fish, such as herring, sardines; also dark beer, tea, coffee, etc. The best nourishment would be food with only little meat and fish, much milk, cheese, vegetables, fruit. This diet acts very favorably upon one factor which plays here a great rôle and this is the changes in the kidneys which prevent the secretion of uric acid and thus may often participate in the

² Sieble, mentioned by Flatau.

development of migraine. Great stress must be laid upon the regularity of the bowel movement; strong purging may help very much in removing toxic substances from the digestive tract, which may participate in the causing of spasmodic contractions of the brain-vessels. I would also recommend frequent sweat baths, which may help to remove toxic substances. Many migraine patients are recommended treatment with mineral water which contain purgatives and at the same time act favorably upon the digestion. Persons suffering from eye migraines should be advised to abstain from strenuous mental work. Actually the appearance of scintillating scotoma occurs most frequently after much reading, much mental work; also after exposure to dazzling light. Quinine, taken often in small doses, is said to act very favorably in such cases. I have succeeded in stopping the beginning of scintillating scotoma by inhalation of ammonia.

During an attack of migraine itself, good results have been obtained with nitroglycerin and adrenalin. As mentioned before, I have been able to see a rapid disappearance of migraine headache in many cases by producing a profuse nasal discharge with sneezing remedies. In nasal obstructions and also in various headaches it is very appropriate to use daily vibratory massage on the nose. According to Hertoghe migraine is often a sign of thyroid weakness, and he often obtained improvement by thyroid treatment. I have also observed attacks becoming more rare after such treatment.

CHAPTER XVII.

CONSEQUENCES OF MENTAL OVERSTRAIN AND FATIGUE, THEIR PREVENTION AND TREATMENT.

It has been established by a number of investigators that in animals which have become fatigued through exertion, the nerve-cells present more or less grave morbid changes. Very interesting in this respect are the observations made by Hodge and others, that in sparrows and other animals the nerve-cells, when examined under the microscope, present degenerative changes when examined in the evening, whereas if the examination is made in the morning, after the animals have rested, they present an entirely normal appearance. We can hardly have any doubt about it, that in the human being similar changes are taking place after work, whereas after rest the nerve-cells present a better and more suitable condition for work. From this it follows that man is most able to work in the morning. We do our best thinking more clearly after awakening in the morning, and many are better able while still lying in bed to make their plans of what they intend to do during the day. Undoubtedly ("Morgenstunde hat gold im Munde") the morning hours are the most appropriate for mental work and the best accomplishments by pupils in school take place during these hours. In regard to retaining what has been learned, however, many think what they have learned late in the evening or at night is best retained in memory. Studying in the evening has, however, this disadvantage, that sleep, its duration and its depth, is very much harmed. Now, we have already mentioned that sleep has for its purpose the removal from the body of poisonous substances which have formed as the result of daily muscle activity as well as the activity of various other organs. If, then, sleep is prevented or shortened, these poisons, as, for example, poisons formed during fatigue, will remain within the body, and

nothing can produce so easily mental overexertion and fatigue as the being awake half the night after long and arduous studying.

The bad results of such being awake and working at nights are shown by the observations of Aschaffenburg.¹ He found in such individuals a general reduction of the mental faculties; perception was difficult, thinking retarded. Kraepelin found, after working through a whole night, a reduction of working ability which lasted almost four days. He attributes this to the irritation produced by insufficiently removed catabolic substances.

Such overexertions, combined with sleeplessness, may have very bad results in nervous persons. The latter are already easily fatigued, and if there is added to it much work and little sleep, then the toxic substances are retained in the body, and we see then often in such cases, with a hereditary predisposition, that these causes give rise to mental diseases. I have already mentioned the case of an engineer, 30 years of age, who had charge of a coal-mine, and who was overtaxed with work, and, besides, had to rise at 3 o'clock every morning to inspect the shafts. After having been disturbed in his sleep for a number of nights he became insane. I should like to add here the case of one of my patients, a young married, aristocratic lady from the eastern provinces of Russia. She was a very intelligent lady, had been very good in mathematics in school, and was helping her husband, who was a rich landowner, in the management of his estates, and was attending to all necessary calculations. Once, after she had been working on these calculations half of the night, she became so exhausted that she was not able to do any kind of work for four days, and had to spend these in bed. In the first case there were no mental diseases in the family; in the second case there was an hereditary predisposition from the grandmother, who was insane, and from the mother, who was extremely nervous. The great mathematician Euler had, in

¹ Aschaffenburg, according to Kraepelin.

1735, accomplished in three days some work which he expected would take him three months. This strain, however, caused him to be laid up in bed, and he, as it is reported, then lost his sight in one eye.² It must also be mentioned that such over-exertions give not rarely the first impulse for the development of arteriosclerosis, particularly of the brain-vessels. In this connection I may also point out the great frequency of this disease, which is caused by mental overwork, in great thinkers and scientists. So had every one of the great scholars described by Ostwald³ shown distinct symptoms of that disease. We must try, by all means, to prevent mental fatigue and exhaustion, particularly in persons already nervous; and we must, in the first place, regulate their sleep. It should never be allowed that sleep should be interfered with by mental work; even reading of harmless books in the evening should be forbidden, particularly if insomnia already exists. All kinds of exertion must be avoided, because if already in insomnia catabolic poisons are retained in the body, it would be still more injurious if toxic substances should be added to them. That such fatigue toxins are formed in the body after muscular exertions we know from the investigations of Weichardt. It is probable that in their destruction the adrenals play a very important part, because if the latter are removed an exceedingly great fatigue and weakness result; the same also takes place when the adrenals are diseased, as in Addison's disease. These poisons are surely removed by another gland, namely, the thyroid, because in overactivity of the latter, in Basedow's disease, great fatigue constitutes an important symptom, and, according to my observation,⁴ it may also be produced by administration of overdoses of thyroid extract.

Muscular exercises, by school-children or students, who have to accomplish a great deal of work, useful as they are, should therefore not be overdone. At any rate, should such

² Moebius, "Die Anlage der Mathematik," *l. c.*, page 49.

³ B. Ostwald, *Grosse Männer*, II Auflage, Leipzig, 1912.

⁴ Lorand, *Old Age*.

exercises be taken, they should not be permitted immediately before nor immediately after the school hours, particularly when the gymnasium is located in the school-house and not in the open air. It must be laid down as a rule that a child who is physically tired out from gymnasium exercises or play should not have to do any studying, as it very soon causes mental fatigue. Even studying is not accomplished without muscle strain, and, according to the newer investigations, as, for instance, reported by Lehmann in Copenhagen at the last International Congress for Psychology, the quantity of carbonic gas given off is increased also by mental work. The muscle tension during the studying may sometimes be very great, as, for instance, when children, particularly myopics, during much writing, must constantly lean forward. Because we concentrate our attention on one point the muscles of the various parts of the body are strained. The movements of the eyes demand work; also, as pointed out by Ziehen,⁵ wrinkling of the brow, gnashing of the teeth; also movements of the facial muscles. When, after a certain time, attention is diminished, then according to Kraepelin,⁶ through the incitation of the will and impulse to work, motor strain sets in. The most natural treatment of fatigue and the prevention of overexertion mentally would consist in establishing regular intermissions for rest. Children should not work mentally longer than three-quarters of an hour, or, still better, only half an hour. Sitting down quietly for any length of time is just as unnatural for human beings as it is for young animals. Jumping around characterizes their nature, and is requisite for them. Of course, children should not, during intermission, run around wild and thus cause inability to study. After 15 or 20 minutes' intermission there should be another study period, a short one. If one and the same subject is taught too long, then, due to monotony, the interest and attention of the children cease. The far-sighted Ignatius Loyola very prop-

⁵ Ziehen, *Leitfaden der Psychologie*, 1912.

⁶ Kraepelin, *Die geistige Arbeit*, Jena, 1892.

erly advised his successors to see to it that their pupils should, after every two hours' study, have one hour rest. Adults should also not study without interruption longer than an hour and a half or two hours. After that there should be a recreation period or at least half an hour, so that the study can be taken up afresh. Such recreation periods increase very much the thinking power. In older children home work should be limited as much as possible. To let them work at night would be a heartless cruelty and the surest way to mental overexertion. Most frequently overexertion is caused by the fact that all studying is left over for a short time before examination. I consider this the best way to flunk in examination, because, to save time, studying is done for many hours without interruption, and the necessary rest and recreation is missing. A brain which has not rested is not in a condition for perception, and what is learned does not become fixed, and is therefore not retained.

Notwithstanding diligent studying—if it is done without intermission—the object aimed at is not accomplished. The time to think over the subject studied, and to have some points which have not been perfectly understood cleared up, is lacking, and this mental reviewing during recreation period is, according to my experience, the surest way to success in examination. Of course, it would be a mistake to use the whole recreation period for that purpose; the free hour should not be injured by mental work, but such a brief reviewing every two hours would not materially injure the rest period. The main law, however, should be that a period of work should be followed by a period of rest and recreation. If one has worked strenuously and feels tired, then the best thing to do, according to my mind, is to lie down for an hour. Still better, to lie down in a warm bed, or take a warm bath for a quarter of an hour, and then rest. Of great advantage are also free afternoons, particularly when they are not spoiled by too much home work; also holy days. Besides other things, the church has done a great deal of good for the

advancement of the public health by the introduction of holy days. The more a mind has time to rest the greater will be its accomplishments. It would be very desirable, of course, if on such holy days one would not be too much tired out by compulsory marches, too high mountain climbing, because this makes one entirely unfit for mental work for some time. Fishing is the best thing for rest and recreation of the mind.

Besides rest and frequent recreation periods, the best way to prevent and treat overexertion and fatigue is by reparation of the used-up strength through the nerve-elements. This can best be done by sufficient or abundant feeding. Mental overexertion can be least tolerated when the nourishment is insufficient. Weygandt found that when food is withdrawn, particularly without supply of fluid, computing and reading are very difficult and inattentiveness is increased. It is, therefore, of great importance that students and all mental workers in general should be well nourished.

CHAPTER XVIII.

INFLUENCE OF THE NERVOUS SEQUEL DISEASES OF SYPHILIS—PROGRESSIVE PARALYSIS, ITS PRE- VENTION AND TREATMENT.

WHEN syphilis in its tertiary form becomes manifest and causes destruction of the bony system of the body, the victim may be inclined to curse at his fate, but he has the consolation of knowing that, in all probability, he is shielded from nervous sequel diseases of syphilis, namely, tabes and paralytic insanity. His sufferings are more easily accessible to cure with Ehrlich's salvarsan than the latter diseases, which present very bad prospects.

Cases of syphilis which, in the first place, or even we may say most exclusively, become treacherously attacked by those nerve and mind deranging sequels of this disease, are those who have shown only slight manifestations on the skin and the mucous membranes, cases in which "everything went all right," as it were. Here and there may have been some roseola spots on the chest and abdomen, of which often no notice has been taken, and the few white spots in the throat and pharynx passed over without causing any difficulties; so that the patients were glad that they got off so easy. And still it would have been better for them if the disease had manifested itself more on the surface covering of the body, because in cases where the disease had appeared virulent on the surface, nervous or so-called parasyphilitic (Fournier) diseases occur very rarely, if ever. Indeed, we have observed that in the Orient, in Java, in some southern parts of Europe, where syphilis occurs very frequently, progressive paralysis among the natives is almost unknown. In the pavilion hospital in Algiers, in the hospital on the Tanger, and in the hospitals in the southern parts of Spain, I saw a whole collection of tertiary forms of syphilis,

such as can be observed in Europe only very rarely; in the insane asylums, however, the inmates suffering from paralysis were only Europeans or other foreigners, but not natives. In Abyssinia almost everybody either has or had syphilis, and still paralysis is there entirely unknown.

This cannot be attributed to climatic conditions, because in Java, notwithstanding the tropical, often humid and continuous sweat-producing climate, the Europeans get paralysis, whereas the Malaysians are spared from it, notwithstanding syphilis being exceedingly frequent among them.

The cause of it is undoubtedly, in the first place, the well-known fact that they passed through the tertiary form of syphilis.

The elder Fournier, in Paris, had a wide experience in this disease, based upon a practice of fifty years, and thus he was also able to observe that just those cases in which hardly any syphilitic manifestations could be found had been attacked most frequently by the sequel diseases. Most of the paralytics which he saw had had before only slight skin manifestations, as, for instance, of 83 paralytics only 3 had shown tertiary symptoms; 78 had medium secondary symptoms; in 2 cases even the latter were absent. He was able to follow up 243 severe cases of syphilis, none of which became attacked with paralysis.

There also may frequently be seen patients with paralysis and with tabes, in whom syphilis has made so little manifestation that it remained unrecognized. Not rarely the place of infection with the syphilitic poison shows only a slight erosion of the skin and may easily be overlooked. The port of entry of the infection may be indicated by a spot similar to the sting of a flea, and such may very frequently be overlooked; and also the appearance of pale, slightly red spots on the skin.

It is often difficult for even the physician to recognize it, and still more so for the layman. Even one who knows he is suffering from syphilis may overlook such manifestations, and one who overlooked the primary manifestations of a chancre is

still more liable not to become aware of them. This is also obvious from the fact that Hudovernig and Gussman could get no statements of an infection having taken place in 42.3 per cent. afflicted with tertiary symptoms. Thus it may occur, that we may observe cases of tabes or paralytic dementia in which the patient has never suffered from syphilis before. To this may also be attributed the fact that not so very long ago syphilis was not considered as the exclusive cause of these diseases. Now, however, we know that the blood of the paralytics gives in each case a positive Wassermann reaction, according to Plant, for instance, in each of his 245 cases. Thus the syphilitic origin of the disease is positively established.

The fact that Orientals are so immune to these diseases may probably be attributed also to two other causes, which we want to mention particularly, because they form the most important initiatives for the origin of softening of the brain, namely: (1) alcohol; (2) their quiet dispositions, and lack of continuous emotions to which the Europeans are exposed, which disturb the blood-circulation in the brain.

According to Junius and Arndt, alcohol does not preferably lead to the outbreak of paralysis more than to any other mental disease. Kraepelin, however, has observed it more frequently in individuals indulging in alcohol. He found that among his male patients 42 per cent., and among the female 15.6 per cent. have used two or more liters of beer daily. The lower educational standard, the more rare exaltations of the Orientals, the unconcerned life which is lived among the Malayans of Java and inhabitants of the southern zones must also be taken into consideration. It is remarkable that individuals of vivid mentality, in whom the brain is most active, more frequently become the victims of this frightful destruction of the mind. For instance, the composer Schumann, and also Nietzsche, Lenau, Markart, have been afflicted with this disease. Moebius¹ considers it

¹ Moebius, Ueber Robert Schumanns Krankheit, Halle, 1906.

doubtful that Schumann had been suffering from this disease; when one, however, reads the post-mortem report of Dr. Richarz, and takes into consideration the various peculiarities of the composer, he finds many things calling to mind paralytic dementia. It is very remarkable that with Nietzsche the disease lasted almost nineteen years, whereas, as a rule, the duration of the disease is considered to be from two to three and one-half years. Moebius, however, justly says that the beginning of the disease is often overlooked, and its duration is considered only the time of confinement to the asylum until death.

Sometimes years pass by without the afflicted person presenting any conspicuous symptoms. It may even occur that some faculties are increased, just as is the case in other mental diseases in their beginning. So we find, for instance, in the case of Nietzsche a particular beauty of language, an affluence of wonderful thoughts, and, aside from these, thoughts of a very bizarre nature, indicating the beginning of mental flightiness. It was during the initial period of the disease that he manifested the condition of euphoria, a predominating feeling of well-being, which is peculiar to this disease. Under its influence Nietzsche accomplished, during the first years of this dreadful disease, an enormous amount of mental work, and wrote a number of books which won great approbation. When we, however, read over some of them, as, for instance, "Zarathustra," it is possible to notice in many places signs of dementia. The particular point, which is striking to everybody, is the peculiar train of thought, which is so characteristic of this disease, and that is the absence of any proportional limitation. That unlimited trend of thought which trespasses all boundaries in every regard is the peculiarity which characterizes the paralytic, and this we find frequently in Nietzsche. The paralytic has the most bizarre ideas. Even when the contradiction and absurdity are clearly apparent, he does not mind it much, and passes over everything. His ideas are adventurous, absurd to the highest degree. At the same time a whirl of color changes occur,

like in a kaleidoscope; nothing is lasting—just the opposite from what is found in paranoiacs. Thought and action are without deliberation; there is no consecutiveness in grasping things and perceptions. Anything of systematic nature is, in the beginning of the disease, disliked by the patient. The ideas of the paralytic do not follow one another in any order; he cannot keep time, and even forgets the names of months and days. Derangement in the highest degree, the most terrible forgetfulness, as seen in Korsakow's disease, is the most conspicuous symptom. One of Kraepelin's patients, for instance, who was working on a building one morning, could not find the place where he was employed.

I know of one paralytic colleague who, while he was examining a patient, left the room to give some order to his valet and then forgot his patient and went out to make his calls. Whereas, we see in many idiots the ease with which they can impress some things on their minds and retain them, but lack in association memory; we observe in paralytics, according to Goldstein's investigations, just the opposite. The paralytic is able to associate ideas fairly well, but he cannot impress them on his mind, or only with great difficulty. In idiocy, as well as in paralysis, we observe the highest degree of mental debility.

Whereas, the idiot is not able to acquire even the most elementary knowledge, and in the highest grade of the disease his life resembles more the life of a beast, and he soils himself with his own excrements, we observe in the paralytic the greatest failing of the sometimes extraordinary brightness which formerly existed, the sudden drop from the highest point of mental efficiency to the lowest, often to that of an animal. It is remarkable that, in the beginning of the trouble, when the patient is apparently still able to attend to his business affairs, shameless offenses against decency may occur, such as satisfying his wants publicly, which leads then to the recognition of the disease. There are, of course, also other slight indications of the disease, such as disorders of speech, of writing (tremor),

in general behavior; but not rarely all these are overlooked until the disease is well established. Kraepelin reports a case of a very busy physician who came to the hospital to be operated on for a finger ulcer. During the night he wandered into the female ward, was there arrested, and it was only due to his confused speech that it was recognized that he was suffering from paralytic dementia.

The saddest thing is that in facing this most terrible of all mental diseases, when it is fully developed, we stand entirely helpless. Salvarsan is of no avail, and the same is also true of the old-established mercurial treatments against syphilis; sometimes they even aggravate the conditions. We have to deal here with such grave changes in the brain-substance that our remedies naturally fail.

How can a remedy act when atrophy and contraction of the brain-cortex has taken place? It is true that recently, as already mentioned, there have been cases in which considerable improvement was observed after artificially produced fever, but in these cases undoubtedly considerable portions of brain-cortex have remained intact. It is, therefore, of utmost importance to get hold of the case at the beginning of it, before diffuse destruction of the brain-cortex has taken place. In the first place, it is necessary to ascertain when the malady was first begun. This, however, is often difficult, because there are a number of symptoms which also occur in neurasthenia, and are, therefore, not exactly specific. There are, however, some which could be made use of, such as the frequent occurrence of eye-migraine with scintillating scotoma in individuals who never before suffered from migraine, and neither suffer from uric acid diathesis or any other nervous temperament. If a person has at any time been infected with syphilis, and he many years later exhibits symptoms of neurasthenia, this may, with all probability, be attributed to syphilis, in case he never suffered from neurasthenia before. The latter is, at any rate, of frequent occurrence in those who formerly had syphilis; it takes place almost, I may

say, in every case in which syphilis has not been radically cured, and the Wassermann blood examination is still positive; but sometimes also in well-treated cases in which the Wassermann reaction is negative. It is, therefore, necessary, first of all, to examine the blood, and if the reaction should prove positive a salvarsan or mercurial treatment is to be instituted. In progressive paralysis the reaction is almost always positive. If we should succeed by the treatment to transform a positive reaction into a negative one, and continuous succeeding examination by lumbar puncture should continuously show negative reaction, then we have the best chances of preventing softening of the brain.

In view of the fact that, when the disease is well developed, the chances in regard to cure are very remote, all depends upon the recognition of the first signs of the approaching disease and the possibility of arresting it. One of the most important signs which may be present, as a prodrome in tabes as well as in softening of the brain, for a number of years, is sluggishness or stiffness of the pupils toward the action of light; also the isolated reflex stiffness of the pupils whereby convergence motility is retained.

Before full stiffness is manifest there exist in the beginning only a sluggishness of the reflexes. It is of the greatest importance to get hold of the case as soon as the disease is recognized. In the beginning of the malady, before great destructions have taken place, iodine may act favorably, but when the disease is fully developed the latter will be of little help.

If, therefore, we find in an individual who at one time contracted syphilis and some years later had attacks of migraine with glimmering of the eyes and a number of other nervous troubles, and, besides that, isolated reflex stiffness of the pupils with retained converging movements, there is a probability of approaching progressive paralysis or tabes, and medical attention should be instituted at once with the greatest energy. This is particularly the case when the Wassermann reaction is posi-

tive and, in addition, the cerebrospinal fluid shows increase of globulin and pleocytosis. Energetic salvarsan-mercurial treatment should be undertaken, and by all means an attempt should be made to bring about a change of the positive reaction into a negative. Owing to the good results obtained by Pilcz and his collaborators with the tuberculin treatment, and also the good results by Fischer with nucleinate of sodium, they should be used simultaneously in this initial stage.

In cases in which a previous syphilitic infection has occurred, the presence of reflex stiffness of the pupils, even in the absence of other symptoms, is sufficient to warrant an energetic fever-producing treatment after a positive reaction of the blood and the cerebrospinal fluid. It would be appropriate for everyone who has had a syphilitic infection to have his blood examined at frequent intervals, and as soon as the reaction becomes positive therapeutic procedures should at once be instituted. Only through radical treatment of syphilis is there a possibility of preventing its sequel diseases. Tabes, as well as progressive paralysis, can be observed most frequently in patients who have not undergone any radical treatment, who have been treated, as is frequently the custom in France, Roman countries, as also in America, simply with internal remedies. Fournier found that 79 paralytics, only 4 had radical treatment, 12 had not quite sufficient treatment, and 37 had been treated less than half a year. Energetic treatment of syphilis can only be accomplished with salvarsan, or, better still, with combination of salvarsan with mercurial treatment. The latter by means of oily, calomel, salicylic or thymol combination. It is self-understood that several courses of treatment are necessary, depending on the results of the Wassermann reaction, which should be frequently undertaken.

At the end of the course of treatment it is advisable, for precaution sake, to take some iodine, but not in too large quantities; not more than $\frac{1}{2}$ to 1 gram per day. It is also proper that a patient, who previously had syphilis, particularly when

he is nervous, or in whose family nervous cases frequently occur, should from time to time have his condition watched by a neurologist or psychiatrist. This is particularly necessary when those around the patient have noticed in his behavior some deviation from the usual. The point is to notice the first lightning. There are some typical signs which indicate the oncoming storm, as, for instance, disturbances of speech and writing. In reading aloud, those individuals who have formerly been untiring, become tired very soon, the words soon become blended; the writing, compared with that done formerly, becomes tremulous, the character of the writing easily changed. Such disturbances, Thomson, in Bonne, had observed sometimes years before the outbreak of the disease. Such changes may best be noticed by the keen eye of the wife of the patient, or by his relatives; significant in this respect may also be the sudden forgetfulness in regard to important engagements, if it happens in persons formerly very punctual. Unfortunately, such mental changes in individuals who otherwise follow a certain routine in their behavior may easily be overlooked until it is too late and irreparable changes have taken place.

Those surrounding the patient may also be misled, even when the disease has existed for some time, by the particular well-being of the patient; but this is often just a typical sign of the disease. When inmates of asylums which I visit, in response to my questions answer that they feel splendid, "heavenly well," then the diagnosis becomes most probable. In such cases it may often be already too late, because the first lightning was overlooked, and the storm has already broken out. Even salvarsan is not of any use. The safest way is to get hold of it before visible changes of speech and writing have taken place, and, therefore, it is best to keep expert control, as above mentioned, by examination of the pupillary reflexes and disturbances of other functions. There is hardly any other domain in therapeutics where the proverb, "An ounce of prevention is worth a pound of cure," may be better applied.

It would be very wise if in public lectures on the dangers of syphilis this point on the prevention of sequel diseases was emphasized particularly; it might prevent an enormous amount of misery.

Of the various sequel diseases of syphilis, progressive paralysis is just the one which injures the mental faculties in the highest degree, and we, therefore, will mention some more preventive measures in the next chapter. Tabes never carries with it any serious mental disturbances, unless it is a case of tabo-paralysis. The other syphilitic sequels in the brain may produce disturbances only by their special localization, except the rare processes of a diffuse nature. This dreadful scourge of humanity may harm the mentality in still another way, and that is by producing arteriosclerosis in the blood-vessels of the brain. The latter is also a very frequent cause of disturbed mentality.

CHAPTER XIX.

THE NATURE AND ORIGIN OF PARALYTIC DEMENTIA.

IN the various reports of my observations on the African sleeping sickness I have expressed the opinion that after grave infectious diseases, which, as is known, injure the thyroid gland, there generally occurs a condition resembling myxedema. For instance, many years ago Professor Darier, of Paris, referred to me a patient suffering from an anesthetic form of lepra (with additional development of a tuberculous form later). I found a myxedematous condition with swelling of the face and hands and sluggish mentality, and was able, by means of thyroid treatment, which was later continued by Darier in Paris, to obtain a reduction of the swelling and considerable improvement of the mental faculties. In regard to sleeping sickness I have also called the attention, in my paper before the German Congress for Internal Medicine at Wiesbaden in 1905, to the fact that this disease differs entirely from trypanosomiasis, and is only a sequel disease of the latter. I also called attention at that time to the first microscopic changes in the blood-vessels of the brain, with accumulation of lymphocytes, resembling the condition found in paralytic dementia. This resemblance becomes most striking in cases of paralytic dementia associated with sleepiness. The similarity in the beginning of the two diseases is also very marked. It generally takes at least from five to seven years, sometimes more, sometimes less, for the appearance of sleeping sickness after trypanosomiasis. I have already mentioned on that occasion that we have here to deal with two different diseases, the first one of which is infectious, and is characterized by the symptoms of overactivity of the thyroid, resembling the condition found in Basedow's disease. After this overactivity there follows an exhaustion which is a condition similar in characteristics to myxedema;

among these characteristics is sleepiness, which we also find in other inactive conditions of the thyroid, as, for example, the endogenous obesity which I have described.

Conditions similar to the above we find in paralytic dementia. The rôle of trypanosomiasis is, in the latter instance, played by syphilis. The latter, like all infectious diseases, affects also the thyroid without exception. The object of the thyroid, as I have frequently emphasized, is obviously to protect us against various kinds of infection; correspondingly it presents, as a rule, a condition of overactivity during the first stage of syphilis, and during the secondary eruptive stage of the latter a distinct swelling of the thyroid may become manifest. This swelling, as mentioned already by Engel Reimers, is more conspicuous in women than in men, and may sometimes lead to development of a fair-sized goiter. In some cases the latter may remain permanent for a number of years. Last summer I had an opportunity to treat a case of neurasthenia after syphilis in a patient from a town in the southern part of Hungary. In that locality goiters surely do not occur, but this patient had one goiter which could be plainly felt on the left lobe of the thyroid, and another, although of smaller dimensions, on the middle lobe. The participation of the thyroid in syphilis, and its changes by it is well-nigh generally admitted; by this, however, is not meant a special localization of syphilitic infection, but the swelling is considered as a reaction indicating the antitoxic activity of the organ. After such overactivity of the gland, an exhaustion and underactivity of it may take place—hypothyroiditis, and also a condition resembling myxedema. Very frequently I have observed after syphilitic infections, particularly in women, a considerable obesity of the “speckig” kind, as I called it, which cannot be attributed to overfeeding or continuous rest. We have to deal here with endogenous obesity, which is due to the changes in the ductless glands.¹

¹ Lorand, *Medizinische Klinik*, 1905.

This variety of obesity occurs in paralytic dementia, and Kraepelin points out particularly that the latter constitutes a manifestation of a disturbance of metabolism. He places paralytic dementia in one group with myxedema, with diabetes and with acromegalia. Only the grave cases of diabetes may be, as I have already pointed out, drawn in here for comparison, because they also show the most symptoms of myxedema. Acetonuria, the main symptom of the grave form of diabetes, occurs also in paralytic dementia.

There are also present a number of trophic disturbances, such as we find displayed in myxedema as well as in grave diabetes: flabby, dry skin; often premature graying of the hair; falling out of the teeth. Brittle bones we find in grave diabetes as well as in paralytic dementia. After a manifested obesity there follows in paralytic dementia, however, an emaciation, and a similar condition we find also in myxedema in its last stage.

I would like to bring in here, for comparison also, the similar conditions in lepra. At the instigation of the late Dr. Isidor Neumann, who at that time was my chief, I visited, in 1893, the leper stations in Jerfso, Sweden, and in Reitsjaerdet, in Norway, and wandered around also in Dalekarlien for the purpose of studying the cases of lepra scattered there. There I was able to observe, particularly in the anesthetic forms of lepra, the typical symptoms of myxedema, the same as found in Dr. Darier's patient mentioned above.

One common corresponding point of similarity of paralytic dementia and the sleeping sickness is, that here also a number of years elapse between the manifestation of the disease and the infection. Lepra is, therefore, particularly in its anesthetic, nervous form, a sequel disease, developed a number of years after infection has taken place, the same as it is in the case of paralytic dementia.

From the above description we can draw some useful practical applications. In view of the fact that degeneration of the thyroid gland, in consequence of the syphilitic infection,

undoubtedly plays a great rôle in the development of its sequel diseases,—the paralytic dementia,—we must improve the functions of the thyroid by thyroid treatment. In this way it becomes possible to increase the metabolism, first of all, of lime and phosphorus, which are just the ones most seriously affected in paralysis. The endogenous obesity is followed by cachexia, and the presence of lecithin in the excrements and its absence in the bone-marrow indicate most clearly the destruction of the phosphorus compounds.

By means of thyroid treatment we must consequently try to prevent these grave injuries which undoubtedly act as contributing causes to the origin of the disease after syphilis. In view of the fact that lack of antitoxic substances in the blood in paralysis has been established, the thyroid treatment may act favorably also in this respect. Moreover, the favorable results obtained by the frequent trial recently of artificially induced fever have an intimate relation to the increase of thyroid activity which is caused by the latter. Actually fever and overactivity of the thyroid, as, for instance, in Basedow's disease, present similar symptoms.

From this follows the necessity for preventing paralytic dementia by the administration of small doses of iodine and thyroid tablets for some time after finishing antisyphilitic treatment. We know, as I have so often pointed out, that iodine acts only through the thyroid gland. If too large quantities of it, however, are given the thyroid activity will soon become rather reduced. Thyroid preparations must also be administered in small doses. If iodine is given simultaneously with small doses of thyroid, the action is, according to my observations, increased. The best way to administer iodine, as well as thyroid, is in intervals, three to four weeks' courses. We are administering iodine not as a remedy against syphilis, but to prevent the sequel diseases, because it elevates the thyroid activity.

It is advisable to partake at the same time of nourishment rich in phosphorus and lime, and also to observe all hygienic direc-

tions given in Section IV. First of all, it is necessary to avoid alcohol, because it acts very unfavorably upon the thyroid, the liver and kidney. The liver and the kidney are also found changed in paralysis, and may also probably be a contributing cause to the development of the disease. Strong emotions and mental overstrain should also be avoided, as these two factors play a great rôle, as mentioned above, in the origin of paralysis. For patients whose means permit it, a sunny climate, sojourn in the high mountains, a southern resting-place during the winter is particularly to be recommended. Even when paralysis has already broken out, such a residence in a sunny climate may relieve the condition; this is seen in the example of Nietzsche, who often mentions in his letters that he feels best in the south in the sunshine of the Swiss mountains.

CHAPTER XX.

THE INFLUENCE OF NERVOUSNESS, NEURASTHENIA AND HYSTERIA, AND THE TREATMENT OF THIS CONDITION ACCORDING TO THE NEWER PRINCIPLES.

INDIVIDUALS who are suffering from neurasthenia or hysteria are usually considered nervous. Nervous is what we call a man who is either sensitive in an extraordinarily high degree, even to the slightest irritations which act upon him, or one who feels very little, even very strong irritations. The first characterizes, in the first place, hysterical women, but many men also suffer from it; the second occurs mainly in neurasthenia, the nervous weakness of men, but is found not rarely in hysteria. Neurasthenia is not restricted to men only, because just as there are hysterics among men, so there are also neurasthenic women. Both affections have in common that in those afflicted the correct judgment for irritations taking place has been lost; they perceive and feel everything in an entirely different way from normal men. Whereas, the neurasthenic does not estimate correctly the degree of irritation, the hysteric gives it a false interpretation. In the higher grades of hysteria there also occur spasms and paralyses which distinguish it very substantially from neurasthenia.

In view of the fact that in these conditions the proper judgment for impressions, as, for instance, for sense perceptions, is lacking, and as our whole thinking is based upon impressions, it is conceivable that nervous individuals also think differently from normal, and consequently deviations in the form of thinking will be noticed. In the first place, they will frequently lack the faculty of quiet deliberation, because they allow themselves to be carried away by their impulsive disposition. The latter leads them frequently to premature, prejudiced opinions, lacking any plausible basis. This is manifested in highest degree in the capriciousness of hysterical women, who frequently are

hardly able to do any kind of mental work. Very embarrassing for them, in this respect, is their extraordinary absent-mindedness, which is caused by the fact that their whole attention is taken up by their own condition, and is entirely lacking in thought for anything else. They are also unable to perceive anything, and this explains their great forgetfulness. One such lady once left her pocketbook in my office; the next time she forgot her gloves, and at another time her umbrella. The continuous, almost exclusive thinking about their own condition makes them blind to anything else; and such persons are often seen walking in the street as if dreaming, and not noticing even their best acquaintances. For this reason accidents may sometimes occur in places where traffic is great; often the victims are hysterical women in climacterium, with absent-mindedness of high degree; particularly is this the case in old maids.

The intelligence is not actually disturbed, even in hysterical women. Not rarely there may be found among them individuals of particularly highly developed intellect, but they are often liable to exaggerate things, just because their perception of the sensory impulses is abnormally high. In some grave cases of hysteria the sensory impulses are falsely interpreted, recollections are false, and if they happen to appear on the witness stand their testimony is false. It is curious that, while they exaggerate slight impressions, they are often liable to underestimate those which produce the strongest reactions in normal individuals. As a very instructive example I will relate here the case mentioned by Oppenheim.¹ One of his hysterical patients told him that she cried when she read novels, but remained calm when her only beloved daughter died. Sometimes we read in the newspapers of the cruelties practised by women on their own children, and it is possible that this is sometimes the case when committed by mothers who love their children very dearly. Hysterical women can become very greatly excited by insignificant things, whereas the most important oc-

¹ Oppenheim, *Lehrbuch der Nervenkrankheit*, IV Aufl., S. 1057.

currences often leave them calm, and the same may be said of neurasthenic men. Much of what has been mentioned above occurs in a greater or lesser degree also in the latter, but there seems to be a great difference between them in one mental point. Hysterical women are easily influenced by suggestion. This suggestibility is significant of their disease, and for that reason they are very credulous, and also superstitious. Every new religious sect, even the most rash, finds followers among them. They lack good judgment. Neurasthenics, on the other hand, possess rather too much of the latter. They easily become suspicious and interpret everything for the worst. Hysterical women are mostly optimistic, but this is more rarely or almost never the case with neurasthenics; the latter are more or less inclined toward pessimism, and their depressed condition does not so often pass into the other extreme as in hysterics. The condition of being one day deeply grieved and the next day very joyful, which is so characteristic of hysterics, is more rare in neurasthenics. Their judgment is thus dominated by the spiritual condition, which is more inclined toward sadness. Unlike so many hysterics who see everything so vividly through rose-colored glasses, the neurasthenics see everything through black or smoky glasses, as it were; everything seems black and hopeless. In their depressed condition they resemble more those suffering from melancholic psychoses. Generally speaking, from neurasthenia and hysteria as a starting point, mainly of the inherited kind, psychoses may occur. It has been already pointed out in other parts of this book that between the two extreme conditions, the normal mental state on the one hand and fully developed mental disease on the other, there are a number of transitional states, and neurasthenia and hysteria may be considered as two such states. According to the symptoms we may here also distinguish the two large groups mentioned above as in the usual mental diseases:—

1. Cases with conditions of exaltation, whereby slight stimulations produce exaggerated impulses.

2. Cases with conditions of depression in which even great stimulations are not strongly felt and small ones find no great resistance.

As is the case in mental diseases, the two conditions may occur alternately in the same person; usually, however, one is predominant. The entire mental activity will vary according to the predominance of the one or the other condition, depending upon whether the nervous system is in a state of overexaltation or depression. In depressed condition the sensory stimulations and impressions will not be as rapidly and as acutely perceived and utilized, the mental perceptions based upon them will be retarded and indistinct, and judgment is disturbed. The nervous system becomes here rapidly exhausted and every physical or mental activity is soon followed by fatigue. Their lack of attentiveness and their absent-mindedness cause bad memory. It is for that reason that we find such patients always making memoranda on small pieces of paper about everything they want to ask the doctor,—*l'homme aux petits papiers* of the French. In exalted neurasthenics deficient memory also often occurs; here the thoughts flash with great rapidity, speech becomes hasty and without reflection; this is very natural, on account of the hurried succession of thoughts. The latter become effaced so easily that the beginning of a sentence is forgotten before the end of it is reached. This happened even in such great men as Hegel, who during a conversation or lecture, frequently lost the thread of it. Due to their hastiness it is only natural that the thoughts cannot be expressed precisely in words, and this explains the often indistinct speech and expression of ideas of many neurasthenics and hysterics.

This is probably the cause why there is a general inclination to consider nervous persons, neurasthenics and hysterical women, as individuals of a low-grade mentality, which is surely not justified, and cannot be proven physiologically. Very many of the great geniuses were nervous, and nervousness may also be found among great scientists, as well as among inventors, inves-

tigators, statesmen, diplomats, and financiers. Their mental superiority just depends upon the fact that their nervous system and sense organs have such a fine construction that they react perceptibly upon very slight impulses. It seems to me that to call such nervous systems mediocre is physiologically unjustified. Just on account of the particular fineness of their sense organs, which are susceptible to the most minute impulses, many distinguished men were led to discoveries. When Moebius² very justly points out that nervous individuals often live long, this, in my opinion, is also dependent upon their refined organization. They notice, for instance, the bad air in smoky localities and the prevailing heat in them, which makes their faces burn, and all other injurious conditions in a much higher degree than other individuals; their fine sense of smell detects bad food at once, and the ability to get prompt warning of impending injury and to quickly avoid it very easily explains their longevity; they also notice the slightest changes in their well-being and seek medical advice when the first symptoms of a beginning disease make their appearance, whereas the so-called normal individuals consult a physician only when a disease is already fully developed. Owing to the acuteness of their sense organs such individuals, on the other hand, perceive many things which are not noticed by others, and to this may be attributed many discoveries and inventions. Through the profuseness of perceptive impulses the imagination of such individuals becomes aroused, and they acquire a great store of original ideas; and it is, therefore, not to be wondered at that nervous children often develop into geniuses, if they only receive a good education, and the education endows them with the necessary critical ability.

We must keep in mind that in our sense organs and in the nervous system we possess very effective means for protection against various injuries. At any rate, great sensitiveness of these organs, combined with rapidity in conveying impressions, cannot be considered as a condition below par.

² Moebius, *Die Anlage zur Mathematik*, I. c.

As an instructive example of the resisting power of many neurasthenics I would like to mention from my own experience a case of a foreign diabetic aristocrat, who was a neurasthenic of a vivid, excitable kind. I have been treating him for the last fifteen summers for his diabetes, which he had inherited and had been suffering from for years before. He arrived here for treatment every time with a large amount of sugar in the urine, and a large, swollen liver. Both would disappear regularly at the end of the season's treatment. Simultaneously with it he suffered in high degree from nervousness and insomnia. Owing to the crippled condition of his legs he has already met with accidental bone fractures six different times. After the last accident, which happened some years ago, I called into consultation the late Dr. Hoffa, who at that time lived in Carlsbad. Everybody knows the grave consequences of accidents in diabetes. Two years ago, in addition to all this, came a stroke. Last summer I had, however, the pleasure of meeting again my old friend and patient in Carlsbad. His condition remained stationary, always the same, only the liver was somewhat more swollen. He had only traces of acetone, sugar 2-3 per cent., which soon disappeared. As a very interesting feature I mention here that the sexual impulse in this patient, who is a man up in years, was exceedingly vivid, something which is rare in diabetics. This is, however, more frequent in neurasthenics of the vivid, excitable kind, whereas in the depressed kind it rarely occurs. In the latter there is often impotence, which is very often the cause of neurasthenia. Generally speaking, changes in the sexual organs, particularly disturbances of sexual impulses, are, as already mentioned before, to be considered among the most frequent causes of nervousness, neurasthenia and hysteria.

According to Baldwin there is often found in hysteria microscopic changes in the ovaries and the uterus. Changes in the thyroid also frequently lead to distinct nervousness; it is of the excitable kind whenever there is an overactivity of this gland, and of a depressed variety when there is an underactivity

of it. That in Basedow's disease all symptoms of hysteria may be present has already been mentioned before.

We thus see that the development of neurasthenia and hysteria may very frequently be based upon injurious conditions originating within the body itself, such as uric acid, intestinal toxins, etc.; and such cases are, therefore, known as *endogenous*, in contradistinction to the *exogenous*, which develop as result of deleterious influences from outside. The latter frequently are toxic substances, such as alcohol or spiritual emotions, difficulties and vices of every-day life, of the social position of the individual. A particularly powerful factor which is also injurious in a great number of neurasthenics is, according to my experience, fear, anxiety, and doubtfulness in regard to the uncertainty of the future. When a person is in fear, his heart beats, his limbs tremble, his pulse becomes flighty. This indicates most strikingly a greatly excited condition of the nervous system. If such a condition in a higher or lesser degree occurs very frequently, may be daily, as is the case in many occupations characterized by uncertainty, with ruin threatening day after day, it is no wonder if neurasthenia makes its appearance. And we actually observe it most frequently in all those callings in which the weight of grave responsibility rests upon the shoulders of *conscientious* men who do everything possible to fulfill their duties, such as jurists, statesmen, physicians, lawyers; also those who are engaged in all kinds of financial affairs and speculations, with all their daily excitements. Wherever it is not known what the next day will bring and fear does exist, neurasthenia is the usual companion. The origin of the latter, as well as that of hysteria, may also be due to some psychological experiences, accidents, and most easily to congenital disposition.

To treat neurasthenics and hysterics in a rational way, it is first of all necessary, as in the case of other diseases, to make a careful examination of the physical condition of the mentality and of the physical condition of the body, and to reach a decision, whether the disease is due to internal or external causes.

Sometimes it is due to a combination of both. If it is due to internal conditions, whereby the disturbed function of the internal secretion glands are often the underlying cause of the disease, then, in many cases of neurasthenia characterized by fatigue and depression, it is possible, according to my experience, to obtain great benefit with thyroid treatment. In exalted neurasthenics and hysterics this treatment may be dangerous, and it is, therefore, necessary, first of all, to examine the pulse. If the latter is very frequent and the individuals are very much excited this treatment is better let alone. In hysterical women, particularly during climacterium, treatment with ovarium tablets may, according to my experience, have very good results in many cases. It is necessary, however, that such treatment should be continued for several weeks. From various sources, as recently, for instance, by Wilhelm Karo³ and Peck, very good results have been reported from treatment with spermin (Pohl). Whether it was only suggestive or not, it suffices to state that it did help, and this is not to be wondered at after all that was reported about the action of testicle extract by Brown Séquard. I have also seen good results in many cases from subcutaneous injections of spermin, less favorable results in the few cases which I treated by internal administration. I have also used in many cases extract of bull-testicle, and found a marked influence upon the symptoms of fatigue and the general condition.

When we have to deal with individuals with greatly exalted conditions I recommend a treatment which gives excellent results, even in the highest degrees of exaltation, such as we find in mental diseases. I recommend rest in bed in a dark room with covered windows, which enables one to eliminate all irritations. In very much fatigued patients it is even sufficient to put them to bed with uniform warmth for several hours daily. With such rest these individuals recuperate very well. For less excited individuals it suffices, after several hours' work, to lie down on a sofa for half an hour or an hour to rest the

³ Karo, W., *Die Gonorrhoe*, Berlin, 1912.

nerves after work. In a like manner, for excited neurasthenics and hysterics, a protracted warm bath, which acts favorably even in mental exaltations, may be beneficial, particularly when this is taken before retiring. The prevention and treatment of insomnia (see III, 3) must form the main part of the treatment. Carbonic acid baths may also be very beneficial. Cold-water treatment and sea-baths may also produce improvement in some neurasthenics with depression, provided they are not overdone; otherwise they do much harm. Very important is plentiful food, to which Weir Mitchell and others attribute many of their good results. Scanty food, or purely vegetarian, may prove very injurious. Tender, soft meat, milk, eggs, cheese and sufficient vegetables, abundant food in general, may be very useful for many neurasthenics, particularly those of the depressed kind, and often also for hysterics. For many depressed patients a sojourn in the sunny high mountains may often do wonders; for many excitable neurasthenics and hysterics this may be rather detrimental, particularly during the first few days. Of great importance is the occupation treatment. Often I have obtained excellent results by ordering garden laboring, as recently, for instance, in a patient, a *canonist*. Hereby the demand for food grows, and thus a beneficial hunger which was lacking for a long time manifests itself. This treatment may be greatly promoted by certain medicaments, such as iron and arsenic. Particularly the arsenic has a strengthening, tonic influence in these patients. There scarcely exists a disease for which there are so many remedies as for neurasthenia or hysteria, but nowhere is it so necessary to specialize as just here. A treatment which is helpful in many cases may be very harmful in others. It is, therefore, absolutely necessary to give individual attention and treatment to each patient; the patient must be carefully studied, and his psychical condition examined. Dubois recommends persuasion and appeasing doubts, and Freud, psychoanalysis, but it must be done only by experienced men and without exaggeration.

CHAPTER XXI.

THE INFLUENCE OF THE DISEASES OF THE THYROID GLAND.

(a) *The Influence of Basedow's Disease, its Prevention and its Treatment.*

BASEDOW'S disease is characterized by the increased activity of the thyroid gland, which causes an increase above normal of the processes of metabolism, and at the same time of all the other functions dominated by the thyroid. In the domain of mental activity, of the processes of thinking, an abnormal acceleration is taking place. There is a rapidity of thought, ideas leap ahead of the words to express them, but logical connection is, nevertheless, retained. Often it results in an excessive volubility; we find here just the opposite of what is observed in myxedema, which we will take up in the next chapter. The talkativeness of many patients with Basedow's disease stands in direct contrast with the slow, lagging speech of those suffering from myxedema.

In Basedow's disease there is often found an abnormal absent-mindedness; the patients are unable to concentrate their thoughts on one point, and this causes disturbance in the ability to retain anything in memory. Most of the patients with Basedow's disease (we consider here the well-defined forms and not the transient forms passing into myxedema) manifest great excitement; often all or most symptoms of hysteria may be here observed, so that Basedow's disease could be qualified as hysteria with tachycardia. In fact, frequently cases of Basedow's disease are taken for hysteria in instances where, as often occurs, the goiter and the exophthalmos are absent. The main symptoms, however, even when the two other cardinal symptoms are absent, are the overrapid heart-activity, the tachycardia, with a pulse often far above 120 beats.

Often there may be present in Basedow's disease a condition simulating drunkenness without the patient (we deal here mostly with totally abstinent women) having used alcohol even in slightest quantity. This condition—the behavior and speech actually remind of drunkenness—is probably due to the toxic influence of abnormally large quantities of the substance secreted by the thyroid gland. Actual drunkenness produced by alcohol or chloroform is, by the way, probably also due to the action of these substances upon the thyroid causing an abnormally great secretion by it. At least, this seems to be indicated by my investigations on chloroformed dogs.¹

Not rarely this abnormally exalted condition in Basedow's disease may degenerate into mental disease. In mental disturbances induced thereby there is also clearly seen symptoms contrary to those of myxedema. I would like to call attention here to the fact that mental disturbances which are due to myxedema are, as a rule, of melancholic-depressive kind; whereas those disturbances which are due to Basedow's disease belong to the class of maniacal exaltations.

The hysterical and neurasthenical complaints which become manifest in Basedow's disease, particularly the insomnia and the fatigue, have a very bad influence upon the intellectual faculties, and often cause inability for calm thinking and mental work in cases where criticism plays an important rôle. In many such patients there is found, moreover, a very high grade of intelligence, which is also contradictory to myxedema.

Particularly that kind of mental activity in which imagination participates is not injured by the disease; not rarely it is increased, but the correctness of memory suffers a certain loss.

According to observations, made also by myself,² the exalted condition which characterizes Basedow's disease can also be produced in entirely normal individuals by administration of large doses of thyroid.

¹ Lorand, Société de Biologie, 25 Apr., 1906. Sur la Pathogenie Narcose.

² Lorand, Old Age.

Basedow's disease being caused by increased activity of the thyroid, the treatment for it must consist in reducing that over-activity. This can be best accomplished by administrations of serum of thyroidectomized animals (sheep), such as antithyroidin of Moebius. Lanz found great improvement after using milk of thyroidectomized goats. I have myself observed great improvement in the symptoms of the disease after using antithyroidin. Last summer I had an opportunity to treat with this remedy a Cuban living in the northern part of the United States of America; he was 26 years of age, father of two children, and was in the most acute stage of the disease with toxic symptoms; he had a pulse of 120-140, a large goiter and exophthalmos. After the treatment his pulse diminished, sleep improved, excitement decreased, overhasty thinking became, it seemed to me, somewhat quieter. In view of the large goiter, however, I considered it necessary to recommend to him an operation which I think is, in such cases, more appropriate than the antithyroidin, although the latter should be first tried. If, however, this does not succeed in diminishing the goiter and substantially improving the toxic symptoms, it is then best to perform an operation for partial removal of the thyroid. At present this operation can be performed without danger by skillful thyroid operators, without general narcosis, using local anesthetics. In cases of small goiters, antithyroidin, together with hygienic mode of life, may act very well. As in hysteria and neurasthenia, here also, according to many authorities, living in high altitudes with abundant nourishment, with food containing large quantities of albumin, may be very beneficial. But milk should, according to my observations, be limited in its use, because milk contains thyroid secretions, and may often increase the activity of that gland. Hector Mackenzie also, on account of this fact, recommends that patients with Basedow's disease should abstain from the use of milk.

I may also mention that favorable results have also repeatedly been reported from treatment with Röntgen rays.

Very often Basedow's disease may be caused by changes in the ovaries; therefore investigations should also be made in that direction. If such symptoms should be found,—chlorosis very frequently occurs in such conditions,—sometimes very much benefit can be obtained by expert treatment with ovarian extract, particularly in young girls and married women. Not rarely Basedow's disease may be prevented in this way. In view of the fact that this disease very frequently develops in congenitally predisposed persons, particularly in daughters of those suffering from Basedow's disease, it is advisable to employ preventive measures in such individuals at the very first appearance of slight swelling of the thyroid, which, according to my observations, occurs very frequently, and is a sign of congenital weakness of the ovaries. The advice which should be given in such cases is: nourishing foods containing plenty of iron, such as eggs, spinach, administration of iron and arsenic in form of medicaments, and mineral waters, together with ovarium tablets. I consider it possible, in this way, to actually prevent Basedow's disease.

In many cases of Basedow's disease I have seen very good effect from a Carlsbad treatment, as I reported at the International Congress in Lisbon. The effect may probably be explained on the same principles as in diabetes, which is similar in its initial stages to Basedow's disease. The effect of the waters concerns only the improvement of the general conditions. After a five weeks' course of treatment there was in one case no changes in the goiter at all. The three others which I treated were cases without goiter.

(b) The Influence of Myxedema and Correlated Conditions of Weakness of the Thyroid and Their Treatment.

Whereas, in the condition of overactivity of the thyroid, in Basedow's disease, considered in the preceding pages, we observed a great mental exaltation with overhastening of the

thoughts and words, we see in myxedema, in which an under-activity of the thyroid exists, exactly the opposite. Here we see, as a rule, rather a scarcity of words; the patients (they are mostly women) who manifest the disease may sit around for hours without speaking at all. If they are asked anything, an answer is given after long hesitation and reflection. Sometimes it may take quite a while before the question is even understood. The answer, when given, shows that the patients are well informed; their thinking power is not weakened, but the process of thinking, as a whole, is very much slower. It takes them a long time to recollect anything, because their memory is deficient. It is a matter of disturbance of the ability to notice occurrences with no desire to think. The patients show absolutely no interest in what is going on around them; they are entirely unconcerned, and this is more conspicuous in individuals who have previously been very active. This state of unconcernedness leads to loss of interest in business efficiency, and other abilities become reduced, as, for instance, they have marked difficulties in accounting, and figuring mentally becomes really impossible. All that, particularly the weakness of memory, brings the patient to the physician almost before any other external symptoms become manifest. The latter may often be entirely absent or very little noticed, and I would like to point out here again that there are many cases of myxedema in which no myxedematous swellings on the skin are visible at all.

The symptoms just mentioned may be more or less pronounced, depending on the grade of the disturbance of the thyroid activity. This is also seen in regard to memory; no matter how deficient the latter is respecting recent occurrences, there always exists a recollection of things which have happened during earlier years of life. Everything which the patient has acquired at a time when the thyroid had functionated normally he remembers well, or fairly well, and this indicates that the thyroid, as has already been mentioned in other parts of this book, materially influences the function of memory.

The difficulty which here exists is to make new acquisition of knowledge. The patient is not able to take in anything new, and this explains his attempt to resist all innovations. This conservativeness is for him a bitter necessity. We observe this often in old people, which is probably due to the degeneration of the thyroid frequently occurring in old age.

Suspiciousness, which often characterizes such patients, may also have something to do with the suggestions made above. According to the reports of the English committee investigating myxedema, as well as of various other authorities, prejudiced suspicion is a typical symptom of myxedematous conditions, and also are compulsory thoughts and compulsory acts. Real mental disturbances, with melancholic conditions, are not at all rare in myxedema. Even in the beginning of the ray, of New Castle. When the patients are sitting quietly in a room, and still more often before they fall asleep, they often disease hallucinations occur, as was pointed out by George Murree such animals as rats and mice running through the room. Hertoghe also made the same observations, and he also mentioned that the patients hate very much to speak about them. This is probably because they do not want to be suspected of drinking too much. According to my observations, such patients are able to consume large quantities of liquor without becoming drunk, and this relates to very delicate women who never did drink at all, but are feeling a desire for it in course of the disease. I saw in Holland a very delicate old maid, 82 years of age, who, after drinking almost a whole bottle of red wine, presented no particular sign of intoxication. She had all signs of the cachectic form of myxedema with great emaciation and deathly pale face. This deathly pale face, in color like the abdomen (white) of a fish, I have often seen as typical in myxedema; also in cretinism and acromegalia, and also as a symptom of congenital weakness of the testicle.

This resistance of patients with myxedema toward the effect of alcohol I have mentioned before in my book on "Old

Age," and in the chapter on prevention of drunkenness I expressed the opinion that it is, in all probability, caused by an underactivity of the thyroid. These patients have actually a desire for something which stimulates their nerves.

Besides cases of fully developed myxedema, in which large portions of the thyroid are degenerated, there occur also cases with only partial changes in the gland. Owing to the fact that the gland is made up of innumerable follicles, it is easy to understand that the diseased process would destroy them only gradually or may attack only a part of them, while the rest will still be able to perform their functions, and the result is a diminution in the sum-total of its action. A similar condition is undoubtedly the case with other internal secretion glands, and this explains the conditions known as "formes frustes."

This myxedema fruste, or the chronic benign hyperthyroiditis of Hertaghe, and all other more or less well-defined cases of thyroid weakness present the above-described typical symptoms of the fully developed myxedema in numerous variations. They occur everywhere where the thyroid becomes affected by injurious influences, as, for instance, after infectious disease, in pregnancy, in diseases of female reproductive organs, during the menopause, after the use of alcohol, and various other chronic intoxications, etc. The most frequent form of such a weakness of the thyroid is obesity, when it is not produced by overfeeding. In the latter we find a weakness of the mental faculties, a disturbed memory. One of my patients, a Belgian lady, 35 years of age, who suffered from an endogenous obesity due to thyroid weakness, could not memorize anything, and complained of having a "tête de linotte." A similar weakness of mental faculties we also find in old people, which may also be undoubtedly attributable to degenerations of the thyroid. We observe³ the whole complex symptoms of myxedema in old age, and, on the other hand, all symptoms of a premature senility are manifested in myxedema in its fully developed form as well as in its

³ Lorand, Old Age.

imperfect forms, very often in individuals below the age of 40. The hair becomes gray and falls out; we observe falling out of the teeth and other disturbances of nutrition in the skin and bony system, and disturbance of general metabolism similar to that which occurs in old age. Such a condition is also noticed after causes injurious to the thyroid, mentioned above; the operation of repeated pregnancies and changes in the sexual organs, and mental emotions; the latter ranking first.

When we, as Hertoghe has already observed, notice very frequently in the children of such individuals symptoms of congenital myxedema in all of its more or less defined forms, this only indicates the hereditary transmission of changes in the ductless glands such as I have repeatedly mentioned. Depending on the grade of myxedema which such children show, whether it is a perfect congenital myxedema or only an infantile type, Lorraine, or only a weakness of the thyroid, the disturbances in the development of mental faculties which they exhibit will vary accordingly. In children with fully developed myxedema, with their large abdomen, open mouth, tongue hanging forward, staring expression, awkward walk, we find, as a rule, a more or less animal-like mental condition, sometimes below that of the dog. Such individuals may grow up to full idiots, and I have seen many of them at the insane asylum in Daldorf. These are generally called sporadic forms of cretinism, but it is a condition similar to the congenital myxedema caused by absence or undeveloped thyroid.

Many such cases are registered, as I have seen in many insane asylums, under the name of idiots, only because they do not show the myxedematous changes in the skin covering of the body. And, nevertheless, everybody who has handled myxedema cases for any length of time and has seen many such patients, knows that a considerable number of such cases manifest all the symptoms of myxedema with the exceptions of just those seen in the skin. These may be absent in the most grave cachectic cases, and may be present frequently in the milder cases.

The name of the disease itself was unhappily selected, because it is given on account of one symptom, and that is the one which is not constant.

The condition of the skin is undoubtedly often present without it being recognized. We must not always expect, as many colleagues do, a puffed-up, edematous condition of skin, particularly of the hands. Often when the myxedema has considerably advanced there is only a certain blending of the outlines of the face with beginning pockets under the eyes.

The sexual organs in children suffering from myxedema, even in the not fully developed forms, are more or less retarded in their development. Very often the testicles have not descended at all, or they are found to be rudimentary, hardly larger than a chestnut, sometimes developed only on one side. In one grown-up idiot at the Daldorf Institute I found, on the left side only, a small testicle, the right one was high up and very small; the thyroid could not be felt. There was a great obesity present on a myxedematous base. The sexual organs in idiots are often found better developed than in patients with myxedema and in cretins, which explains their erotic acts.

In cretins, also, neither the thyroid nor the sexual organs are well developed. In less grave forms they may develop somewhat more; then we find the secondary sexual characters, as, for instance, the beard, more pronounced. Cretins stand somewhat higher in the scale of mentality than idiots and the grave cases of congenital myxedema, except in the more severe cases of cretinism, when they resemble the idiots.

Cretinism occurs endemically in certain locations where it is caused by climatic and geologic influences. According to my opinion it is caused by three factors:—

1. Absence of sunshine.
2. Presence of substances injurious to the thyroid in the drinking-water.
3. Insufficiency of calcium in the foodstuffs and in the drinking-water.

The reason that there are so many cases of cretinism in the Aosta Valley is probably because here are combined all three, or, at least, two main factors: absence of sunshine and deficiency of calcium in the drinking-water.

The gravest cases of myxedema, and also of cretinism, are hopeless idiots; in the lighter cases there is an educational possibility, and we will consider them later. We want to mention here that they all show a more or less certain difficulty in perception; they are very narrow-minded, and able to imitate when anything is shown to them, but their own initiative is null. They have the slightest remembrance of what they most frequently see or hear, and never go beyond this point; thus have received the name cretin, which indicates that such an individual lacks any kind of higher perceptive power. Some cretins are well fitted to do various kinds of routine manual labor. Conversation with cretins may be carried on only about most simple things; they understand everything with difficulty, but if they once understand a thing well, they retain it in memory, sometimes for a very long period.

The deficient mental development of all children suffering from congenital weakness of the thyroid, from myxedema and cretinism, is mostly due to the poor condition of their organs of sense, which are frequently defective; deaf and dumb often occur among them. In cases of thyroid weakness, adenoid vegetations are quite common. These are the cause of disturbances in the brain-circulation, and also of great absent-mindedness and inattentiveness. Many cretins have deficient hearing, and the sight is also apt to be weak, while disturbances of speech are also often found.

Fortunately we possess a remedy to improve the mental activity of individuals suffering from the various forms of thyroid weakness, namely, by administration of thyroid gland. The sooner we begin with it the better are the prospects. If it is myxedema we must begin the treatment at once, as soon as the diagnosis is made. If we allow the trouble to get headway great

results cannot be expected. The grave cases, in which the thyroid is already entirely degenerated, can hardly be influenced, and the treatment in such cases cannot prevent the deadly end, having been begun too late.

It is naturally impossible to hope for anything when the brain-cortex has undergone wide and irreparable changes. As soon as the thyroid is absent or is entirely inactive, toxic substances, to the destruction of which the thyroid otherwise contributes, exercise their injurious influence upon the brain-cortex, and if such a condition continues for years, very grave changes in it would take place. Of what benefit can a thyroid treatment be when the convolutions of the brain are atrophied and those parts which are the seat of most important mental functions are destroyed? The thyroid treatment should be applied to promote the function of the remaining or undeveloped parts, and this should begin at once with the infant at the breast, by administration of thyroid to the mother, and, possibly, iodine in the appropriate case. To proceed in a radical way it should be begun during the mother's pregnancy, as soon as a condition of thyroid weakness has been ascertained. In this way it would probably be possible to even prevent infantile myxedema and cretinism. Such a procedure would, at any rate, be appropriate in case of mothers who have already given birth to a myxedematous or cretinous child. While the positive conclusion is not justified, that all her children would be the same, this is, however, as a rule, the case in those localities where cretinism occurs endemically. Women suffering from myxedema, as a rule, do not have children; on the other hand, women having a weak thyroid and suffering from a benign chronic hypothyroiditis may have children, although sterility not rarely occurs among them, or they have difficulty in childbirth, and may also have trouble during pregnancy. According to my experience sterility in women is very often caused by weakness of thyroid associated with weakness of the ovaries, which is also proved by a number of good results which I have had through combined treatment

with thyroid and ovaries. This treatment may also show its benefits in overcoming the sexual coldness which is so frequent among women with deficient thyroid. At any rate, such combined treatment may have a favorable influence upon the physical as well as mental condition in the offspring of women suffering from weakness of the thyroid and ovaries.

It is, therefore, necessary to treat the mother, the nursing infant and the growing child, and the treatment should be continued in the more slight cases until puberty, which in this instance sets in much earlier; in the more grave cases treatment should be continued throughout life. Of course, in a continuous treatment the doses should not be large. In children it should begin with half of a tablet, later one or two tablets daily, depending on the constitution of the child.

If treatment is begun when the children are older, it is necessary to give somewhat larger doses, but more than two tablets daily will hardly be necessary. If started during the years after puberty the good results will be less apparent, but will be best if started in early childhood. Wagner von Jaueregg,⁴ who has treated a large number of cretinous children, has, however, obtained good results even after the age of 20.

Often very surprising improvement may be seen in such children in regard to mental faculties; perception and interest for work grow, and the formerly absent-minded and lazy children become better pupils. We will take up the subject more fully in other parts of the book, and will consider more in detail the course of thyroid treatment.

(c) Influence of Goiter upon Mental Faculties and Its Treatment.

As soon as changes become manifest in the thyroid gland, changes may also be expected to be found in regard to mentality, due to the interrelations which exist between the two.

⁴ Wagner v. Jaueregg, in *Handbuch der Psychiatrie*, Berlin, 1913.

And we actually notice a more or less distinct influence upon the mental faculties, the degree of which depends upon the gravity of the disease of the thyroid. This can be seen in the case of goiter, the character of which will be found reflected upon the intellect. If the goiter consists of connective tissue, which can be recognized by its toughness, the important transformations in the tissues have already taken place, and the larger the goiter is, the larger the area of the gland that is involved. If the degeneration is more diffusely spread we may also predict a reduction in the mental faculties. We, therefore, find such goiters frequently in cretins; often we find colloid degenerated cysts in them; sometimes they are very large, other times they may be of small dimensions. In some locations, particularly in the valleys with scarcity of sunshine, for instance, in Switzerland, in Steiermark, in the Tyrol, and in the upper parts of Italy, goiter is always found. Although not every individual having goiter is a cretin, in view of the fact that dwarf growth is, as a rule, found in cretinism, it follows that deep destruction has taken place in the thyroid, or that this gland has been congenitally undeveloped; other injurious causes may, of course, also have contributed to it.

Such an injurious cause is positively found in the drinking-water, because we know that in localities where goiter is endemic, immigrants from other districts also have goiter, and the domestic animals (dogs) also suffer from it. This becomes particularly noticeable in persons coming from locations where goiter is unknown. I will relate a striking example from my own experience. Some years ago there came to Carlsbad for treatment one of the great manufacturers from Malaga, with his family of eight members. Among them were three boys, whom I treated for three summers. They spent their winters and springs in Lenzburg, Switzerland, and all three came to me, to my surprise, with large goiters, whereas they formerly had not the slightest indication of it. In southern Andalusia and in the region of Malaga I have never seen any goiters.

Furthermore, we know from the investigations of Birchers that drinking-water in those localities contains a substance which is injurious to the thyroid, but that the water may be made harmless by boiling.

Besides the drinking-water there are other factors; for instance, insufficient sunshine. Sunshine is, as already mentioned in other parts of the book, an energetic promoter of thyroid activity. I want to mention again that, at Chamoutix, goiter occurs only in the shady side of the valley, and that in sunny lands and localities goiter does not occur. I have never seen such during my travels in Arizona, California, Mexico, Colorado, Florida, etc. To the two factors already mentioned a third must be added, and that is calcium deficiency in the soil and in the body.

All these are only external, exogenous causations of the goiter. We distinguish, however, another, the endogenous form, which is caused by injurious substances within the body itself. Endogenous goiter is very often caused by diseased ovaries, and this confirms the law which I have promulgated in my previous writings, namely, that changes in one ductless gland cause changes also in the others; in this case of the thyroid. So we also see the formation of a goiter in anemic young girls and women. Such endogenous causes undoubtedly produce also goiter in Basedow's disease. Often, if not always, it is produced by toxic substances originating within the body, but sometimes also it is produced artificially; even we may possibly say by carelessly rubbing the neck, or by taking potassium iodide internally by individuals who are predisposed to Basedow's disease. This goiter is, however, distinctly different from the goiter in cretins. Because it consists only of an enlargement of the secreting tissue, this goiter is, at least in the beginning, more or less soft and active, while the other is, as a rule, hard and inactive; only after Basedow's disease has lasted for years the goiter may become hard. Then, however, the volcano became extinguished and a transition to myxedema has taken place.

Goiters which originated during pregnancy and delivery may also, after awhile, become of hard consistency.

With the external bodily differences in the two different kinds of goiters—the exogenous, rather hard, fibrous, on the one hand, and the endogenous, rather soft, glandular, on the other—correspond also the differences of the intellect. In the first case there is a rather torpid condition, with certain limitations in the mental faculties, approaching more the depression; in the second case there is no reduction of the intellect; sometimes even very good mental disposition, but, frequently, also a morbid disturbance, bordering on maniacal excitation, and exceedingly often hysterical and neurasthenic conditions.

In localities where large goiters occur, and in individuals with large, hard goiters in general, which I have examined—and it is not a few—I have observed surprisingly often a more or less distinct mental torpidity. They were, as a rule, quiet individuals, following their occupations always in the same old fashion; they could talk quite intelligently, could keep up a conversation about the vital questions of the day, and expressed intelligent opinions, but in answering difficult questions they were at a loss. They are phlegmatic; nervous excitement, except in justified serious occasions, is a very rare occurrence. Never have I seen one who had distinguished himself mentally. The most extreme type of this narrow mentality we find in cretinism, where the thyroid is changed in the greatest degree.

It is interesting that the three children mentioned above have also not been so clever and bright as they had been before. One of them, previously a very bright boy, seemed to me to be sleepy, and the other two have also not shown the mental vivacity of previous years. As an illustration of the influence of goiter in the dog I might mention that in the house in Carlsbad, where I formerly lived, there was a black rat-catching dog with a large goiter who was, therefore, called by the neighbors "Steyrer." He stood around sleepy all day long, and I cannot recollect that this rat-catcher had caught a single rat during

many years, notwithstanding that the latter emerged not rarely from the sewer, and wandered into the yard.

Before beginning the treatment of a goiter, it is necessary, by examining the neck, to ascertain its nature, whether it is a hard, fibrous one, or of a soft, glandular variety. Of course, the examination of an enlarged thyroid on the living is not an easy matter. This statement I am justified in making after sixteen years' continuous study of anatomical and physiological conditions of the thyroid, in health and disease. Not rarely the thyroid, in living individuals, is found apparently very little enlarged, and at the post-mortem section a voluminous thyroid is found, which was hidden away under the sternum. Often one sees externally only a small goiter, whereas on the inside it has already caused compression of the windpipe, with distinct obstructions in the respiration. On the other hand, an enlargement of the thyroid may already be assumed when its contours are already distinctly seen externally, particularly if this occurs in men. In women this enlargement is often distinctly seen in the middle lobe; in men such indications are, as a rule, absent. If the examination is made while the head is bent forward the contours may be felt most distinctly. If the tissue is found to be very hard, which generally indicates connective tissue, then a treatment with iodine and thyroid is to be recommended. The iodine may also be used externally in form of an ointment. If the tissue is soft, either voluminous or of a small size, a similar treatment may be tried in case of young girls or women suffering from anemia and weakness of the ovaries. It is necessary, however, to find out whether there is hereditary Basedow's disease in the family. In case of a pulsating goiter or an existing exophthalmos such treatment would be criminally careless. At any rate, except in cretinous goiter, we must always examine the pulse before treatment, because a thyroid and iodine treatment should *never* be instituted in case of a rapid pulse—say, more than 90 beats per minute. In such cases "hands off," because we have to deal with overactivity of the thyroid.

CHAPTER XXII.

INFLUENCE OF EPILEPSY AND ITS TREATMENT ACCORDING TO MODERN PRINCIPLES.

EPILEPSY does not, in all cases, have a bad influence upon the mental faculties. This may be concluded from the fact that such men of genius as Julius Cæsar and Napoleon were afflicted with this disease. If, however, we leave out of consideration these exceptional cases, we find that in general one of the features of this disease is a more or less pronounced reduction of the mental faculties. Epileptics are very often dull mentally; have difficulty in understanding things; have a bad memory, and when they tell anything, they do it in a circumlocutory way. Not being able to distinguish between essential things and non-essential, they relate a great deal about unimportant features, and the important ones they mention only in a few words. Answers are given very slowly; expressions are awkward and faulty. Their circle of ideas is concentrated around the nearest concrete subject; their ideas are very limited, and abstract thought is very difficult; judgment of any kind is arduous, and very often it is wrong. It is very laborious for them to think, particularly to calculate, and often they miscalculate to their own disadvantage. Weakness of memory does them, very often, much harm. Some epileptics very often have conditions of confusion, of dreaming, of uncertainty in which they actually perform deeds unconsciously; they may even undertake journeys, as in the celebrated case of Legrand de Saully, a merchant, who, being in such a condition, undertook a journey to Bombay, and only upon arrival there woke up from his dream. During such states they are liable to perform the most curious deeds, even crimes. One of Kraepelin's patients, in his presence, climbed up on the lightning rod, two stories high, to the roof of the house and came down again, without being able to remember anything about it. It

often happens that such individuals stop in the midst of talking, do not speak a word for a few minutes, and then return to their conversation. In such a case I was consulted during the summer of 1911 by a Protestant minister, to whom it frequently happened that he would suddenly become dumb during the sermon for several minutes, and then could proceed again. Such attacks may also occur in children, whereby changes in the mental faculties may be noticed, and later on also indications of moral insanity. A case of that kind and its development I can cite as an example. It was that of a child, of a well-to-do French family, who would, in the midst of a conversation, stop, be as if absent-minded for a few minutes, only whispering sometimes to himself, and then come to again. When the boy grew up he, notwithstanding the frequent attacks above described, graduated from high school without any extraordinary difficulties, and then entered as volunteer in the cavalry. Now, the family physician, my friend Professor Launois, in Paris, wrote to the colonel of the regiment, asking for his release on account of the epilepsy, but because an objective examination showed nothing, the request was refused. One day he had an attack just at the time when he was exercising horse-back riding in the armory. He rode against a tree and the horse was injured; he was then released. Soon after, however, he made an immoral attack on a young girl, and was put in the insane asylum at Villeneuve, where he still is. He never forgets to send a New Year congratulation to Dr. Launois, and the answer which he receives he keeps for months and shows it around. A patient may, for years, have major attacks of epilepsy, without his mentality being in any way reduced; many attacks are, of course, injurious, particularly in older people. On the other hand, again, very serious cases of mental dullness may occur, even in some of the mildest cases of epilepsy. Very instructive in this respect is a case of Binswanger.¹ He had under observation a lady 76 years of age who, notwithstanding her having epilepsy and being

¹ Binswanger, *Die Epilepsie in Nothnagel's Handbuch*, II Auflage, 1909.

old, was very highly gifted, manifesting a freshness and vivacity of the mind and judgment. When she had an attack late at night she would be completely prostrated physically and mentally for several days, but after confinement to bed for several days she would feel entirely well again. Otherwise in older people often repeated attacks, as a rule, have a very bad influence upon their mental faculties. Younger individuals may keep themselves in good condition in spite of violent epileptic attacks. I observed, for instance, four years ago, an epileptic young woman, the wife of a German merchant, who apparently had a normal intelligence and showed a vivid interest in everything. Only her memory suffered very much from taking bromides. Her pale and greatly puffed up face, swollen hands and dry skin, bags under the eyes, slow speech and some other symptoms so distinctly reminded me of myxedematous conditions that I decided to put her on thyroid treatment. The result was that the face improved very much, swelling of the skin lessened, expression became finer; epileptic attacks, which previously were frequent, almost weekly, remained absent for several months, and all this in spite of the fact that she suffered a very violent mental shock during the first week of the treatment. Very favorable results with thyroid treatment have also been obtained by Frohme and Hoppe,² also by Stern. Bolton reported at a meeting of the Dutch neurologists and psychiatrists that he obtained very good results with thyroid treatment in all the 20 cases of epilepsy which he treated. The effect of these treatments may be explained by the probability that the toxic substances which undoubtedly play a great rôle in the etiology of the disease, for instance, uric acid, are, by the administration of thyroid, either eliminated or their abundant formation is prevented. The same explanation may also possibly be given of the fact that a milk diet, which, as already mentioned, is most favorable to the thyroid, acts, according to the experiments of

² Frohme and Hoppe, quoted after Kraepelin, *Psychiatrie*, Bd. iii, VIII Auflage, S. 1169.

Alt and Hoppe,³ also favorably here. Based on these experiments the latter investigators recommend, in epilepsy mainly, a vegetable diet with low salt content and plenty of milk. Very injurious for these patients is alcohol, which also acts unfavorably upon the thyroid. Under the influence of alcohol the conditions become worse, and it, even more than syphilis, plays a very great rôle in the origin of epilepsy in those congenitally predisposed, as well as in cases developed in the adult.

³ Alt and Hoppe, *Allg. Zeitschrift für Psychiatrie*, lix, S. 713.

IV INCREASE OF THINKING ABILITY BY HYGIENIC AND THERAPEUTIC MEANS.

CHAPTER XXIII.

PROMOTION OF MENTAL FACULTIES BY HYGIENIC MEANS.

A GREAT part of the misery which oppresses mankind is due, undoubtedly, to syphilis and alcohol. Poverty, which is so frequently associated with them, causes underfeeding. What makes these scourges so horrible for mankind is not their direct consequences, the terrible destructions of body and mind, the idiots produced by them, and also the miscarriages, but the indirect sequels which may extend through many generations. An alcoholic or syphilitic may produce a number of children, some of them become high-grade idiots, others may be fortunate enough to escape idiocy, but they will be of lower mentality and unable to make progress in school. Such a case of a family of many children of a syphilitic father was reported some years ago by Geza von Dieballa.¹ If the offspring of a syphilitic, who is more or less mentally deficient, should marry, his children will probably not be so stupid as the children of the first generation, but they will not be entirely normal. One can naturally transmit only what one possesses, and in this way undoubtedly may originate entire generations of lower mentality. In a like manner may be transmitted an inferiority of the physical condition of the body. We know well that the quality of the ductless glands, as, for instance, of the thyroid, may be transmitted, as is shown in the case of Mendel,² in which the child had a goiter, the mother had one, and also two aunts and a grand aunt on the mother's side. Now, syphilis and alcohol affect the thyroid, and in newly born children of syphilitic parents one

¹ v. Dieballa, Deutsche Zeitschrift für Nervenheilkunde, 1911.

² Sitzung der Berl. Gesellschaft für Psychiatrie u. Nervenkrankheiten ref. Archiv für Psychiatrie, Bd. xxxviii, S. 294.

finds, as before mentioned, a congenital degeneration of the thyroid. Children born with such glands very easily become victims of all kinds of infectious diseases, just because the glands which protect them against these diseases are degenerated. We thus observe how syphilis and alcohol ruin whole generations, and it may justly be assumed that probably a great part of the constitutional diseases, such as scrofulosis and tuberculosis, particularly tuberculosis of the bones and various kinds of mental deficiencies, may ultimately be attributed to the dominating bad influence of alcohol and syphilis during a previous generation. These are personified evils, the deleterious influences of which may possibly be felt much farther on than in the third generation, and it may be said, in general, that nearly all the misfortune and misery of mankind, physical as well as mental, may be attributed to sins and excesses of previous generations. To ameliorate such bad consequences as much as possible, inter-marriages among the various nationalities and various classes of people would be appropriate, because the bad consequences of consanguineous marriage may be due to the augmentation of such harmful hereditary influences. It would probably be possible to improve the coming generations, physically and mentally, by such eugenic measures.

At any rate, the injuries caused by syphilis and alcohol should be prevented from spreading further, even if it be necessary to use draconic severity. First of all, the blood of all men intending to enter matrimony should be examined for the Wassermann reaction, and if the result is positive, marriage should be prohibited. We have not yet reached the stage to demand the same from women. The deliberate spreading of syphilis from one person to another should be considered as a crime, and punished as such. *We owe it to the future generations* to use the most rigorous methods for preventing the spreading of syphilis, and this cannot be considered as limiting personal liberty if we do not consider as such the right to injure the health of others. Such principles of freedom were

not in the mind of those who promoted the French revolution. The same thought should be used in regard to the safeguarding of men and property, and to prevent the proliferation of alcoholics. In all domains of medicine there is at present a wholesome tendency toward rigid prophylaxis; may it be applied in this respect particularly with the utmost thoroughness.

In our efforts, moreover, we must also take care of the child as yet unborn, because influences which may later ruin the body and mind are already active, even when the offspring is still within the body of the mother. First of all, a pregnant woman must have the necessary care appropriate to her condition. Unfortunately, poor people, on account of their poverty, act in this respect with great ignorance and negligence. Many a peasant would take more care of his pregnant mare and would not let her work as hard as he would his wife, who may be far advanced in pregnancy. But it is necessary to show the same care for the future human being as is shown for the unborn calf, and a time may come when the duty of the State will be extended so far that the condition of feeding and care of poor pregnant women, and particularly of illegitimate mothers, would be under its control. The conditions in general which exist at present among so many who are to become mothers are a mockery to our civilization. In the interest of perfection of the body and mind of future generations a change in this respect is urgently needed, and, first of all, the ridicule and mockery directed toward unmarried mothers, which is entirely unbecoming in our century, should cease, "*Hats off before the pregnant woman, whether she came to her condition by law or without the law, because in her speaks the voice of nature, and she carries under her heart the future of our nation.*" I think that intelligence and civilization of a people may be judged by the way they treat their women. In no other nation of antiquity were the women so well treated and had so much freedom as among the old Egyptians, and these were undoubtedly the most civilized and the most intelligent people of their time.

Among the most intelligent nations of the present time, as, for instance, England and America, women occupy, undoubtedly, an exceptional position, and enjoy much more freedom than among the less advanced nations, where they are treated like slaves, and hardly dare to go out alone. If we, therefore, want to think in advance of the future, and this foresight is the right sign of intelligence, then we must give the woman, as the carrier of the hope of mankind, an exceptional position; and we should not overburden the delicate woman with work like a pack-horse, which, by the way, makes her fertility doubtful. This should be forbidden by law. The best way to prevent it would, of course, be the improvement of the material condition of the poor. Poverty plays a rôle here, and it is also co-operative with these other injurious causes which are so harmful to mentality of mankind, syphilis and alcohol. Properly speaking, want should lead to moderation, but actually it is not rarely the real instigator of intemperance and the mother of drunkenness.

Greatest moderation in the use of alcohol is to be recommended to all those who have the condition of their mental faculties at heart. Instead of using alcohol during mental work, coffee and tea could be used, but of these also strong infusions should be avoided; and those whom the use of these beverages agitate too greatly should use the harmless maté of *Ilex paraguayensis*, imported from Paraguay and Brazil. Tobacco, when used in small quantities, can surely do no harm; there are many men who would not be able to think over any problem or put down anything in writing without smoking a good cigar. The habit of smoking we find also in many great thinkers, as Spinoza, for instance, whose only pleasure was smoking the pipe. Spinoza was, by the way, a Dutchman, and in Holland almost every man smokes, many from early childhood. It seems, however, that this excessive smoking has not harmed their mental faculties to any great degree. During the seventeenth and eighteenth centuries they surely did not smoke less, possibly even more, because the pipe was then in vogue,

and small Holland was at that time the world's center for scientists. It was the common meeting place of the great thinkers and investigators of Europe; Descartes, Leibnitz, Swedenborg, Linné, Locke, and many other great scholars remained in Holland for a long time for the purpose of study, and most important mental productions have been published in Holland. Young physicians from all parts of the world used to make pilgrimages over there to hear the lectures of the great Boerhaave, whose works have been translated into many languages, even into Turkish. Together with other great men, Carlyle was a passionate lover of the pipe, and this may possibly have been the reason for his constant stomach troubles.

Too much smoking may act very injuriously, however, upon the mental faculties, particularly in young individuals, and great credit for calling attention to this fact is due to a Dutchman, the Amsterdam clinician Pel,³ who observed the bad consequences of it and its unfavorable effect upon the blood-vessels. It is, after syphilis, one of the first causes of arteriosclerosis, which, by reaching to the blood-vessels in the brain, does great damage to the intelligence of the man. If an individual had syphilis even in the mildest form, and notwithstanding vigorous treatment shows a positive Wassermann reaction, and at the same time smokes much and drinks much alcohol, he may soon get ready to make his will, because the danger for the body and mind is very great, particularly when he also eats much. Too rich feeding is just as bad, not only for the body, but also for the mental faculties, as is underfeeding. Weygandt published observations which show that hunger diminishes application and increases inattention; also the faculty of association becomes considerably worse, not only when only little food or no food is used, but when water also is not given.⁴ Hunger also causes difficulty in memorizing and learning anything by heart. We thus see how important sufficient nourishment is for school-child-

³ Pel, Eine Tabakpsychose bei einem 13jährigen Knaben, Berliner klinische Wochenschrift, 1911.

⁴ W. Weygandt, Ueber die psychische Wirkung des Hungers, Münchener med. Wochenschr., 1898, S. 385

dren and students, and we will consider this in a separate chapter. It seems to me probable that a scanty diet is most beneficial in such mental work where accurate reasoning is most necessary; in exact scientific studies, as mathematics, for instance; and in such cases, a vegetarian diet, if it is not carried to extremes, may be profitably tried; but in such work where imagination is necessary, as, for instance, that of artists, composers, dramatists, etc., a liberal diet, with the addition of meat, would be a very good thing. The latter produces also a more vigorous influx of blood to the brain-cortex, particularly when stimulants, such as a little wine, coffee, or tea, are taken in addition. Of course, *to the addition of wine should be credited a healthier judgment*, which restrains a too vivid imagination. Shakespeare and Burns have the reputation of not having despised a good drop, and Byron was addicted to the use of geneva. Scanty diet intercepts a profuse blood-supply, and it thus promotes a cold, sober judgment. We think most soberly when our stomach is empty; therefore in the early morning hours. When we wake up in the morning and remain in bed for a while the clearest thoughts come to us, and we have the best judgment about various problems. The empty stomach and horizontal position which facilitates the influx of blood to the brain are contributing factors, but this is not the same as a hungry stomach before a meal while at the same time moving about, or a full stomach after eating. Many people are able to work best during the early morning hours—for instance, in the case of the writer, between 4 and 8 o'clock in the morning. Others, again, can work best during the night hours, as, for instance, the distinguished traveler and naturalist, Sven Hedin, who works all night through, then goes to bed at 5 o'clock in the morning, sleeps until 2 o'clock in the afternoon, and at 3 o'clock receives his visitors.

We could easily make the day longer and work more if theatres and amusements would begin, not at night, but in the early evening hours, after an early supper, and work would

begin earlier in the morning. It is quite unnatural to sleep late in the day; the natural thing would be to use the evening for amusement, the night for sleep, and reserve the day for work, and use the holidays for pleasure trips. In this way sufficient time could be found for the recreations so necessary during working days, exercising, walking, etc. For any kind of mental work the latter are of great importance to retain the mental faculties intact. It shows the great wisdom of Ignatius Loyola when he recommended to his disciples, in educating their pupils, to introduce a recreation recess after every two hours study. It is a sure thing that mental overstrain may produce very bad consequences on the well-being of the body as well as on that of the mind. So did Mozart, by such overstrain even in his earlier years, dig his own grave, into which he sank so young. He, to whom the only pleasure was his work, remained, as he himself stated, awake the whole night long working on his operas, and this caused great injury to his health. Also, Goldoni, who wrote sixteen theatrical plays in one year, had to atone all his after-life for such excesses in mental work.

The distinguished naturalist, Sir Humphrey Davy, after returning from dinner, worked often in his laboratory until early in the morning, but contracted arteriosclerosis prematurely, and died at the age of not quite 50. He used himself up by too much work, having been so diligent that he even did not take the time to change his shirt, but put a new one on top of the old one, and frequently had on several shirts at the same time.⁵

How necessary it is for our intellectual faculties to observe the rules of bodily hygiene is shown in the example of Napoleon, who neglected it in his eating, as well as other habits, and whose breakdown occurred in conjunction with his failing health. He spent many sleepless nights in ardent study of maps and charts and planning of battles. Often he alone was awake while his generals slept. He was a man of highest intelligence, who worked out his plans in all their details in advance with the

⁵ Nach W. Ostwald, *Crosse Männer*, II. Auflage, Leipzig, 1910.

keenest foresight and never depended on anyone else. He depended once only on one of his generals, who was to bring him reinforcements in time of his greatest need during the decisive battle of Waterloo, and he was disappointed, and his fate was sealed. Particularly unfavorable consequences may follow such reckless spending of mental forces by overexertion, when it causes insomnia, which, by the way, occurs very often. So did Boerhaave once, when being deeply engaged in solving some problem, suffer from the effects of the overstrain in such way that he could not sleep for six weeks. Sir Isaac Newton, as reported by Locke, once, after very strenuous mental work, suffered with insomnia to such an extent that for two weeks he could not close his eyes. This led to very bad consequences for him, as he became mentally confused, and only regained his mental faculties by refraining from all work for several months. There is hardly any greater factor, or one that can do as much harm to the intellectual faculties as insomnia, particularly when it is combined with mental overstrain in an individual suffering from a congenital trait. It is not to be wondered at, then, that Pascal, who manifested traces of nervous symptoms in childhood, should through such causes have become melancholic, and end his life in insanity at the age of 39 years.

Resting the mind after every overstrain is, therefore, one of the first hygienic rules. Recognizing this truth, Descartes wrote his favorite pupil, Countess Elizabeth, sister of the Kurf. Karl Ludwig (the same man who offered to Spinoza the professor's chair in Heidelberg), that he gave his thoughts to philosophical problems one to two hours daily, but no more. Darwin had the habit of working mentally only three hours daily. If a visitor carried on an animated, spirited conversation with him for any length of time he would ask for permission to retire, as the conversation made him think too much. With mental capital, even more than with money capital, one needs to economize, and should not waste it uselessly. There are many men who waste it in useless discussion, lingering for a

long time at *table d'hôte*, debating important questions with people who are entire strangers to them, and thus unnecessarily tax their minds. All this means a great dissipation of the mental capital, although one may consider it as recreation. The latter is, however, surely not the case. It may also happen that persons of nervous temperament upon such occasions become excited, causing an elevation of the blood-pressure, which is usually the case after excitement. This, however, should be avoided altogether, because it has a bad influence on the blood-pressure, and may facilitate the development of arteriosclerosis. Of course, nowadays it is very hard to ward against this, as anxiety and fear of coming, perhaps fatal, occurrences may more than in any other way promote the development of neurasthenia or hysteria, and thus injure the intellectual ability and the quality of mental production in general. Owing to the exceedingly great competition in all lines, the rivalry to surpass everybody else and in everything, often followed by disappointment, in addition to the excitement of the competition, results in nervousness. If, in order to contradict this, it is pointed out how in past centuries, owing to the turbulent conditions existing at that time, no one was sure of his life, that during the thirty years war murder and debauchery were an every-day occurrence, I would say that because of this very fact men may learn to adapt themselves to the most adverse conditions. If one sees around him murder and death every day he becomes accustomed to it and it loses its horror. As an example I may call attention to the calmness with which so many young girls (according to the report of executioner Samson) went to the guillotine during the French revolution, often even laughing during the last journey. If one constantly has to face death, he does not fear it; this is the case with young soldiers who become accustomed to the smell of powder. Moreover, we cannot reproach the sixteenth and seventeenth centuries, because in all the acts of cruelty, and also in their highly criminal acts, they tortured only the body. Today, on the other hand, men are tortured in a way that is far

beyond bodily torture, for when his honor is attacked a man suffers a soul-racking torture that cannot be expressed. It seems rather paradoxical in this materialistic age that men should be so vulnerable in this respect. Many a man would rather undergo the punishments of the inquisition, and stand the pinching with red-hot pliers, than to lay bare before his good neighbors, in open court, his most secret and carefully guarded family affairs. The learned jurist who, as a punishment for crime, introduced the loss of civil honor, temporarily in Germany, permanent in Austria, must not have understood much of human nature, because there can be no better means to make an habitual criminal out of a man who became a criminal through want. Oh! if only those learned men possessed an ounce of what is not taught in universities, namely, common sense. And, then, we have still another modern tormenting arraignment for the mind, and that is the examination, a Moloch to whom are sacrificed the flower of youth and their nervous systems, which to that date were intact, the object being to make them more brilliant, and therefore increase their intelligence. Whether their mental maturity is thus gained is rather doubtful; certain it is that preparations for examination and the overstrain caused by it often induce grave disturbances of the nervous system and mental faculties, the consequences of which may be felt for the balance of life.

Our so-called humanitarian age, with its *modern cruelties*, has nothing, therefore, to hurl back at our old ancestors. Properly speaking, if we examine matters more closely we are not very much in advance in spiritual matters, surely not in the fine arts, for in painting, and possibly also in literature and music, we stand rather on a lower scale. Only along mechanical and technical lines have we perfected ourselves, but surely not in the gifts of mind.

We are bold enough to call our time the century of enlightenment, of great inventions. If, however, we trace to the bottom of things, we find we are only reaping what our ancestors

have sown. All of our knowledge in the various spheres is, so to say, the ultimate natural consequence of the discoveries and inventions of great investigators during past centuries, such as Galvani, Volta, and others, which we, thanks to our more perfect technical means, at last utilize practically. We have become more practical, but not much wiser; we are still under the spell of the old masters and still derive from their philosophy the old spirit, as, for instance, from the teachings of Aristotle, by which we are still dominated. We boast proudly of our flying-machines and other inventions, whereas ideas similar to our own have been advanced centuries ago, and much that now seems to be entirely new in the realm of medicine had been known before, and now has been rediscovered. Francis Bacon, for instance, speaks in 1624 of the glass lenses, by the aid of which the most minute objects could be plainly and perfectly seen, of instruments by means of which the voice of man and animals could be imitated, of boats swimming under the water, of conducting sound for long distances by means of pipes, of machines flying in the air; he actually therefore foresaw all our modern discoveries. Just as false is it to call our century a humanitarian one. In the struggle for existence, be it that of individuals or entire nations, there are not fewer men annihilated than at the time of the Assyrians and the Pharaohs. Of course, thanks to our more perfect technique at present, it is done more thoroughly and quickly. Truly speaking, this is only natural, because, after all, human nature remains the same; I know nothing about any essential change having taken place in the parts of the skeleton, the muscles, the cells of the organs, the construction of the brain, the glands. Surely no changes have taken place in regard to the instincts of man. Whether he is dressed in bearskin, as thousands of years ago, or wears a high silk hat and kid gloves, he is always tormented by the same instincts, hunger and sexual instinct, which drive him to mischievous deeds, with only this difference, that now he handles not the club, but the malicious revolver. The bait which is used by the

leaders to ensnare the public is the same as was used in old Rome. Only in one respect has a change taken place, and that is that the religious disposition seems to have been lost. And yet we see that such great thinkers as Descartes, Pascal, Leibnitz, Bacon, and scientists like Haller, Ampère, Faraday, Pasteur, Arago, and many others have manifested a pronounced religious disposition. Moebius⁶ also points out that "pious, even church devotees, among mathematicians occur very frequently," and mentions the names of Euler, Kepler, Gauss, and others. Baruch (later Benedictus) von Spinoza was also not such an atheist as was supposed, for his biographer, Colerus,⁷ relates that he taught the children of his landlady to go to church frequently. The same may be said about Kant, whose old table companions were the ministers Jachmann and Wasianski, and who sometimes, himself, delivered sermons in country churches.

⁶ Moebius, *l. c.*, 125.

⁷ Johann Colerus, *Das Leben des Bened. von Spinoza*, Frankfurt und Leipzig, MDCCXXXIII.

CHAPTER XXIV.

HYGIENIC MEANS TO IMPROVE THE BLOOD-CIRCULATION IN THE BRAIN.

THE great Dutch physician Boerhaave made the suggestion that the feet should be kept warm and the head cool, and the correctness of this view was confirmed several centuries later by O. Müller¹ and his pupils. These investigators have found that the application of heat to the periphery of the body reduces the blood in the brain, by contracting its blood-vessels, whereas cold, by dilating the blood-vessels of the brain, may produce too great congestion of blood to the brain. Cold feet must, therefore, be avoided by individuals who suffer, for instance, from arteriosclerosis of the brain-vessels. Warm foot-baths would be of great advantage. Daily warm foot-baths would be a very useful hygienic measure, especially for brain-workers, who do very strenuous mental work. It would be of benefit to follow this by rubbing the feet with alcohol or eau de Cologne, which is by itself a very good remedy for cold feet.² Full baths are also useful for the distribution and circulation of the blood in the brain-cortex. It is well known that protracted warm baths are used in congestive conditions of the blood in the brain in maniacal conditions. Also after strenuous mental work, particularly in nervous individuals, a somewhat protracted warm bath may be very beneficial. For depressed individuals, on the other hand, a pleasing cold bath of short duration may produce a better influx of blood to the brain and enliven the disposition. These cold-water procedures must be adapted to the individual, otherwise they may do harm instead of good. In cases where a reduction of the blood-supply to the brain-cortex is desired, car-

¹ O. Müller and Siebert, *Zeitschrift für experimentelle Pathologie und*

² Lorand, *Old Age.*

bonic acid baths may sometimes be used profitably, as they produce a congestion of the blood to the periphery; such baths may also be very beneficial to nervous, excitable individuals suffering from insomnia. For a proper blood-supply to the brain it is very important to avoid as much as possible any kind of disturbance in the general distribution of the blood. In overloading the stomach with foodstuffs which are difficult of digestion, for instance, a congestion of the blood to the digestive organs takes place, which is withdrawn from the general circulation, the nourishment of the heart with blood becomes deficient, and the blood-supply to the brain is also reduced. This is also the cause of difficulty in doing mental work and sleepiness after eating. A similar condition takes place when in protracted constipation the fecal matter remains too long in the intestines. In this case also free thinking may be rendered more difficult, and when one wants to think soberly and critically, a thorough cleansing of the intestines by laxative may be very useful.

Moderation in eating and a sufficient evacuation of the bowel daily must, therefore, receive particular attention if we wish to have a proper circulation in the brain. This is of great importance, particularly in mental work, and especially when critical meditation is required; a rational diet, abundant in vegetables, fruit and desserts, and, when necessary, laxative mineral waters, is to be recommended. In arteriosclerosis of the brain a profuse purging should be ordered. I, myself, have observed good results in course of treatments in Carlsbad from the use of the cold spring. Whenever the blood-pressure becomes too high it is necessary to attend to a proper evacuation of the bowel and the proper activity of the kidneys. We know well that the condition of the latter plays a very important rôle in the origin of arteriosclerosis. A stimulation of the functions of the skin by sweating is also to be recommended to counteract high blood-pressure. All this can relieve an overburdened heart, and an improved heart activity will also improve the conditions of blood-circulation in the brain. Frequently outdoor exercise,

such as walking, will also act in a very hygienic way, as the exercise will cause more blood to flow to the periphery, and thus relieve the overfilled brain-cortex. For brain-workers, walks of one or more hours daily are, therefore, of great importance, but if the heart and the blood-vessels are not in the best order, greater exertions, such as climbing up steep mountains, should be avoided. While it is more hygienic to give the brain entire rest during these recreations, in practice it is very difficult to accomplish, because the thoughts rush upon us with such force that we are unable to ward them off. In such cases I would recommend to those whose circulation permits it that they select steep mountain roads as a help to distract the attention from the thoughts. During such lonely walks in nature's solitude, however, sometimes the best thoughts come. As an example I may mention Beethoven, who, during his stay in Moedling, near Vienna, wandered from choice through the fields and mountains, and at the same time thought on his compositions. The same was the case with Rousseau, who mentions in his confessions that he could only think and work during his walks. Some people are only able to work when it is perfectly quiet; others, again (these are rare, it is true), think best during noisy concerts. They become stimulated, and this is followed by a condition of inspiration, which plays such a great rôle in great creations. My opinion is that, though quietness is better for critical work, noises may sometimes stimulate imagination. Strong sensory impulses produced by a concert, for instance, in causing excitement, may increase the blood-supply to the brain. According to Lehmann³ an increased blood-supply, a more rapid blood-circulation, produces also a more rapid metabolism in the central nervous system, and this increases the power of imagination. If, on the other hand, the blood-circulation is slow, then the individual ideas become separated again. Of great importance for the metabolism and blood-circulation in man, as well as in the animal, is the sunlight. Light and shadow play the

³ Lehmann, *Die Hauptgesetze des Gefühllebens*, 1892.

same rôle in human life as the good and bad. The light corresponds with the good, and the shadow with the bad, because all the good comes from the light; it dispenses life, nourishment and health to man, animal and plant; in the shade, through the want of light, disease and death take their origin. In the same way do the light-fearing mob, the destroyers of human life, the various minute organisms, thrive best in dark places, wherein sunlight never reaches; here they are most certain to spread diseases, menacing not only the health of the body, but also of the spirit; these organisms fear the sun, because its rays mean death to them. Similar to the growth of a young tree, or like plants in general, a young human being thrives only in sufficient sunlight; where the latter is lacking, it must, as we show distinctly in various chapters of this book, perish in body and in soul. Without the light of the sun man cannot procure his nourishment; it would have to become one-sided, deficient in that which is so needed, namely, vegetable and grain food; and also in mineral matters, which are so essential for the building up of the brain. As it is shown later, he could not make use of all these important matters for the body economy without the aid of light. Where light is missing there also is mental darkness found most frequently, and cretinism and idiocy, as already mentioned, are most often found in the mountain valleys, where the light never penetrates or is insufficient. We should, therefore, seek the light and avoid the shade, which is liable also to be the origin of colds, tuberculosis, rheumatism, and many other ills of the body and mind. Only in sunlight man is able to preserve his powers of body and mind, and keep them in order.

Staying in the open air has the advantage that we absorb not only much of the sunlight, but also much oxygen, which is of greatest importance to the nourishment of the central nervous system. Free respiration is then simply indispensable, not only for the health of the body, but also of the mind. A sufficiently deep inspiration and expiration is therefore a necessity, and it should be exercised as much as possible in pure air, during

movements in the open air. It promotes a lively blood-circulation and a better blood-supply to the brain. Systematic respiratory gymnastics can influence very favorably the blood-circulation, and systematic deep breathing, in weakness of the heart and in arteriosclerosis, may be of very good service. This can be carried out best, as is shown by the investigations of Bruns and T. Pick, by breathing with pressure below normal. This promotes and greatly facilitates the venous circulation, and the blood is discharged more easily into the right chamber of the heart. The left chamber also works better, and, therefore, the whole body, and consequently also the brain are better supplied with blood.

Due to the fact that the breathing pressure is below normal, the diaphragm functionates better, and thus the abdominal viscera are relieved of blood. This will also improve headache. Besides the deep respirations we may also promote the circulation to and from the brain by appropriate and hygienic clothing. Tightly adhering underwear arrests the circulation, but worst of all are corsets and tight collars. The latter presses upon the jugular vein, and thus interferes with the downflow of blood from the brain. We must keep in mind that the blood-vessels of the brain have a communication with the outside, through the nose as well as through the outer covering of the skull. The latter are formed as shown by Hyrtl's investigations, by the veins branching off from the venous plexus of the dura mater, pierce the bones of the skull, and ultimately enter into the jugular vein. The blood-circulation of the brain may, therefore, be relieved by drawing off the blood to the outer skin of the head. In his well-written topographical anatomy Hyrtl⁴ relates that during his travels in Arabia he observed how, in a case of sunstroke and also of dizziness in the head, the Bedouins produced slight punctures on the head, upon which the hair is cut short with their sharp yatagan, causing a flow of blood, which was followed by relief. That a tight-fitting collar may event-

⁴ Hyrtl, *Handbuch der topographischen Anatomie*. Wien, 1860.

ually produce a sensation of stupidity, and also interfere with the mental work, I have often observed on myself. War should, therefore, be declared upon these instruments of torture, particularly during hot summer, from a hygienic standpoint. During the hot weather we must cover those parts least where the blood-supply is greatest to the periphery of the body, as the neck and at the wrists; and during the winter we must keep those parts warm, because it is here the body cools off most.

The harm done by tight collars is, by the way, also seen from the investigations of Reschnikow and Davidenko.⁵ These authors state that tight collars produce difficulty in the flow of the arterial blood to the brain, and of the venous blood from the brain. From the work of these investigators is also seen the importance of a correct respiration, and in this respect one organ, which we have already mentioned, plays a great rôle for the blood-circulation in the brain, and that is the nose.

⁵ Reschnikow und Davidenko, Beiträge zur Pletysmographie des menschlichen Gehirns. Zeitschrift für Neurologie und Psychiatrie, iv, 2, S. 129.

CHAPTER XXV.

THE IMPORTANCE OF TAKING CARE OF THE NOSE AND ABOUT OCCASIONAL SNUFFING.

WHEN the nose is stopped up through a bad cold, thinking, as already mentioned, becomes difficult. Children who suffer from a stopped-up nose on account of adenoid vegetations remain backward in their studies. That the condition of the nose has an influence upon the blood-circulation in the brain we have already mentioned. The stopping up of the nose may, however, also have a very bad effect upon the activity of the brain, by interfering with the supply of oxygen to the brain, which, as we know from the work of Berger,¹ is of great importance for the activity of the central nervous system. When the nose is obstructed it is necessary to breathe through the mouth, but by mouth-breathing it is never possible to get pure air, rich in oxygen, into the lungs in such a quantity as it is by breathing through the nose. Children suffering from adenoids get stenosis of the upper air-passages while in deep sleep during the night, so that they are awakened by the difficulty of breathing; this can be easily recognized by watching them when they sleep. Such children may grow up with a deformity of the chest, which injures the important gas exchange in the lungs, and thus prevents the receipt of a sufficient supply of oxygen. When, therefore, children are backward in their studies and dull,—there is often present a condition of idiocy or imbecility,—it may be attributed to the difficulties in blood-circulation of the brain due to the continuous inflammation of the mucous membrane of the nose; and, further, also to deficiencies in functions of several of the other sense organs, as, for instance, hearing, sense of smell and taste, due to the changes produced by the adenoids. While idiocy as a sequel of adenoid

¹ Berger, Beiträge zur Lehre vom Blutkreislauf im Gehirn, Jena, 1910.

vegetation is not altogether a frequent occurrence in children afflicted with the disease, there very often occurs an inability to concentrate their thoughts upon one point, a condition to which the Amsterdam ear specialist Guye² gave the name aprosexia nasalis. This is, moreover, as we showed in our chapters on mental work and memory, a very great obstacle in studying, because it makes it impossible to discern and memorize various things. Guye made the observation on many students, who suffered from such vegetations, that they made no progress at all in their studies, particularly in mathematics. That the adenoid vegetations were the only cause of this was proven by the fact that soon after the adenoids were removed by operation the condition improved, and these students could successfully pursue mathematical studies. Also in children who were backward before, great improvement of their mental faculties could be observed after the operation. It is advisable to perform the operation very early, at any rate before puberty; particularly should this be the case with children who are idiotic to a great degree, if they have adenoids. I have had the opportunity many a time to observe, in various insane asylums, high-grade idiots in whom adenoids were removed after puberty, at the age of 16-18 years, who manifested no improvement of their mental condition. This cannot be wondered at, because if the blood-circulation in the brain and its metabolism, on account of obstructed supply of oxygen, due to stenosis of the upper air-passages, has been difficult through many years, there could have been no possibility of a normal development of the brain and nothing can naturally be gained by such an operation when degenerative processes in the brain-cortex, continuing for years, have already produced irreparable changes within that organ. That the results obtained will be the more favorable, the earlier it is actively attended to, is certain. Surely, not every idiot who has adenoid vegetations would be cured if these were removed in the proper time during childhood, but no one would dispute

² Guye, Deutscher Naturforscherkongress, 1878.

the fact that, by making possible a better supply of oxygen, and consequently a better metabolism in the central nervous system, his chances for educational ability would be increased. Besides adenoid vegetations, nasal breathing may also be made difficult by long standing, chronic colds in the head, with resulting hypertrophy of the nasal mucous membrane. To prevent an accumulation of secretions it would be advisable to properly care for this very important organ, to irrigate the nasal chambers daily with lukewarm water by means of a nasal douche. The open end of this glass apparatus is inserted into one of the nostrils, the head is bent backward, and then the water runs out through the other nasal opening. Inhaling ammonia may also be of advantage sometimes to free the nasal opening for breathing when it has become obstructed through the swelling of the mucous membrane. Every one knows, from their own experience, that when the nose is obstructed it is impossible to think clearly, and mental work is often interfered with. According to my own experience, inhaling of ammonia may very often bring much relief, a dry nose becoming moist, because the discharge of secretion is stimulated. By sneezing much of the stagnated nasal secretion may be removed. If a mixture is made of thymol, the powder of dried white sneeze-root, with majorana and powdered Florentine root, or powdered milk-sugar (for women the quantity of sneeze-root may be about 3 per cent., for men 3 to 4 per cent.), and a little of the mixture is inserted into the opening of the nostrils, the desired effect may be obtained in a few minutes. The well-known tobacco snuff acts in the same way. If the latter is only used occasionally to free the nose, nothing could be said against it, but not if it is used continually, daily in larger quantities, therefore to excess. And still we see that many of the greatest thinkers, great men, like Kant, Hegel, Frederick the Great, Napoleon, and others, were ardent snuffers, and indulged in it during their mental work or when they were engaged in thinking over important and difficult problems. I have often been assured by old gentlemen

who have been snuffing for years that their heads were relieved by the snuff, and their thinking became easier. A short time ago I was told by a Belgian colleague, a well-known psychiatrist, that the bishops of his diocese have prohibited the use of snuff among the priests, and that some of them were very much embarrassed, and maintained that it was very helpful to them in their mental work. There may possibly be some truth in that, and it would be worth while to give this matter a further trial. In persons suffering from arteriosclerosis of the brain-arteries, snuffing and frequent sneezing may have very fatal consequences. In view of the fact that the blood-pressure is considerably increased by sneezing, the question could be justly raised whether long-continued, ardent snuffing is not a contributing cause for the development of arteriosclerosis of the blood-vessels in the brain. I may, however, mention that I often met very old men, ministers, who have been ardent snuffers for many years, and have not shown any signs of this disease. The danger of development of such a condition is, however, very great in snuffers who, at some time previous, had syphilis and are great smokers; or have used alcohol to excess, and, besides that, mentally exert themselves; or in those who are afflicted with some disease of the kidneys.

CHAPTER XXVI.

THE FAVORABLE INFLUENCE OF A SUNNY, HIGH ALTITUDE UPON THE INTELLIGENCE.

WHILE visiting the Insane Asylum at Nizza it struck me that almost all idiots, without exception, came from the surrounding deep mountain valleys, as Vesubie, for instance, where the sun hardly ever penetrates. I recalled then that similar conditions may be observed in Switzerland. Here idiots with large goiters and cretins are found in the valleys with very little sunshine, and the same is the case in Austria-Hungary, in Steirmark, and in the Tyrol. It can even be distinctly established that cretinism only occurs on the shady side of the street, and not on the sunny side of the same street. We know that the quality of the drinking-water has a great influence upon the origin of goiter; however, where we have to deal with goiter, associated with idiocy and cretinism, then some other important factors must also contribute to these conditions. According to the following, we can hardly doubt that the most important factor in this respect is the absence of sunlight. Fifty years ago, an old practitioner, Dr. Besancemet, in Aigle, near Montreux, obtained considerable improvement in the mental condition of cretins and mentally backward children by removing them from the surrounding mountain valleys to Leysin, situated at a height of 1400 meters. The cretins, who formerly had been entirely unfit for any kind of activity, became docile, and could be trained for various kinds of work when they returned. Leysin then became known as a place of cures for the mentally retarded long before anyone discovered that it was a place which would benefit tubercular patients.

These surprising effects can only be explained by the influence which the sunny, high altitude exercises upon that organ,

the changes of which are the underlying causes of the production of cretinism, and that organ, no one can be in doubt about, is the thyroid gland. That the presence of sunlight in its perfect purity in Leysin is actually able to produce a favorable effect upon the activity of the thyroid I have been able to observe myself during my stay there to study the effects of sunlight. In Dr. Rollier's clinic a large number of children with tuberculous ulceration of the bones are treated.

I saw there surprising cures of these affections through the treatment with sunlight, which is a generally well-known fact, and probably is obtained also in other localities. Of particular interest were Röntgen pictures of one case taken before and after the cure, which showed that not only a beautiful callus formed on the diseased bone of the one leg, but the Röntgen shadow of the whole bone was much more opaque and less transparent than in the other leg. Undoubtedly there was a much better nutrition established in the bone of the leg which was irradiated by the sunlight, and this received a greater supply of calcium than the entirely healthy leg, but not irradiated by the sun. In view of the fact that bone-growth is regulated mainly by the thyroid, we must attribute the main effect to the latter. This was also indicated by still another condition, and that was the growth of innumerable long hairs, which appeared on the irradiated extremity, also in girls. And it is a well-known fact that growth of hair is also influenced by the thyroid, and is increased by an increased activity of the thyroid. We have already repeatedly alluded to this fact in other parts of this book, as well as in the book on "Old Age." I would also like to mention that, according to the reports from Dr. Leuba, Dr. Rollier's assistant, bone fractures heal by treatment with sunlight in Leysin in a surprisingly short time.

Besides the promotion of bone and hair growth I have observed still another phenomenon in Leysin, which indicated an increased activity of the thyroid, namely, a greatly increased diuresis which I was able to observe in myself. When I

reported this to Dr. Leuba he told me that frequently in cases of tubercular peritoneal exudations and of ascites, with liver cirrhosis, patients lose 3 to 4 liters of urine daily only through irradiation of the sunlight.

The appetite, while there, was enormously increased, so that I could eat about twice as much as usual. We know, moreover, that the stay on the sunny mountains greatly increases the metabolic processes, and that could not possibly be the case without the influence of the thyroid, which, as is well known, regulates these processes. Another indication of an increased activity of the thyroid is the observation made by many investigators, *e.g.*, Zuntz, A. Loewy, Müller, and Caspary,¹ of the increase of the number of white blood-cells in such climates, as well as the increase of the total quantity of blood. That the thyroid has an immense influence upon the blood-formation we have already emphasized in our previous writings.

It is interesting that in Leysin I could do with less sleep than usual. After five hours' sleep I felt very well rested. For those suffering from sleepiness, a stay in such climates would, therefore, be very stimulating. We have, moreover, already mentioned that the condition of continuous sleepiness can also be attributed to changes of the thyroid. Fatigue also does not as easily take place in such climates. I have undertaken in Leysin very strenuous tours on the plain land and in the mountains, and became tired very little. Treatments with thyroid act in the same way, if they are not used to excess.

The disposition and mental condition in such a climate is, as I was able to observe in myself and others, particularly on a great number of children, a very animated one. Notwithstanding that many of the children were compelled to lie in bed quietly for months, they were very lively and cheerful. Answers given to questions indicated a vivid intelligence. That a 3-year-old Hungarian child learned German and French from those

¹ Zuntz, A. Loewy, Müller, Caspary, *Höhenklima und Bergwanderungen in ihrer Wirkung auf den Menschen.* Leipzig, 1906

around him in two months, I have already mentioned in another place in this book.

This stimulation of the mental faculties also points to influence of sunlight upon the activity of the thyroid gland. The examples given at the beginning of this chapter may also be explained in the same way.

As further supporting proofs I want to mention the findings of P. F. Richter² and Schrumpf³ that the stay in such climates has a very favorable influence upon obesity. In many cases considerable loss in weight was obtained, which is similar to observations made in treatment with thyroid. I also want to point out that Schrumpf, in St. Moritz, former assistant of Recklinghausen and Moritz, has observed in cases of grave diabetes, which have occurred in that place, a disappearance of acetonuria with considerable improvement in general conditions without using any special diet.³ I, myself, was able, as reported in my treatises on diabetes,⁴ to obtain in every case disappearance of even large quantities of acetone and acetonacetic acid from the urine by administration of thyroid tablets. To make the similarity between the results of the treatment with thyroid and a stay in a sunny, high altitude still more evident, I may add that Schrumpf had also observed a very much increased elimination of uric acid in patients with gout. According to observations reported by myself and others, treatment with thyroid acts in the same way. There is, therefore, along the whole line a corresponding effect from thyroid treatment and a stay in a sunny, high altitude.

The favorable results obtained in high altitudes in diseases of the nervous system, in neurasthenia, and mental disturbances by Erb, Laquer, and others, may probably also have been con-

² Richter, Ueber klimatische Unterstützung der Entfettungskuren. *Zeitschrift für Balneologie*, 1908, S. 26.

³ Schrumpf, Les effets physiologiques du climat de hauteur. *Journal Médical de Bruxelles*, 12 Jul., 1912.

⁴ A. Lorand, *Rational Diet*, etc.

nected with the improvement in the activity of the thyroid, which is a regulator for the nervous system.

In favor of the fact that sunlight increases the activity of the thyroid may be adduced that all the symptoms of overactivity, such as elevation of the temperature, associated with great increase of the number of the pulse-beats similar to high fever—the fever itself is, as I have shown,⁵ a Basedow-like symptom, and is caused by increase of the thyroid activity—may be produced by being exposed too long to the sun-rays in a sun-bath. Other symptoms may be sweating, great weakness, fatigue; everything the same as during fever. Actually every fever is only an arrangement for defense in our bodies, to destroy and eliminate toxic substances.⁶ It has also, as is well known, been shown by a number of investigators, as, for instance, by Delattre,⁷ Ruediger, Hektoen, Rosenow, and others, that during convalescence after fever diseases, the blood contains more opsonins. We know, however, that the content of opsonins in the blood depends on the activity of the thyroid, as considered in Chapter II of this book. Similar actions have been found by Malgat⁸ and Barse with regard to sun-treatment.

Corresponding with this we are also able, as shown already in our previous writings, to obtain all symptoms of fever by administrations of thyroid preparations in excess. Of the actions of sunlight we may possibly think that they cause dilatation of the peripheral blood-vessels, and also increase the phosphorus and calcium metabolism, as well as the antitoxic processes within the body; it, moreover, acts directly as a microbicide. It thus has a very powerful influence not only upon the human body, but also upon mentality, and is simply indispensable for the bodily as well as the mental welfare.

To fully utilize the mentioned effects of sunlight certain

⁵ Lorand, *Clinical Observations on the Origin of the Fever*, *Lancet*, 1907, Nov. 17.

⁶ Lorand, *Old Age*.

⁷ *Revue Internationale de la Tuberculose*, Octobre, 1906.

⁸ Malgat, *La cure Solaire*, Paris, 1912.

conditions must be fulfilled. We know, as has been mentioned elsewhere,⁹ that a greater part of the sun-rays become absorbed when, before reaching us, they have to pass through several strata of clouds and smoke. We receive them at first hand on high mountain summits. Some localities are particularly favorably situated, as, for instance, Leysin, where the sun is reflected by a widely spread snow-cover, while behind there is a high mountain wall. For that reason the sun-rays develop there such a heat (40° to 50° C.) that naked children run skis on the snow. I have climbed in deep snow, in my shirt-sleeves, up to my hotel, situated on a mountain, and was then in a perspiration.

Equally healthy are Davos and St. Moritz in Switzerland, and Tatra-Lomnitz and Tatra-Fuered in the Carpathian mountains in Hungary. A wonderfully clear sun is also found in the Tyrol mountains, and in some valleys, particularly so in Meran, farther on; also on the beach of the Mediterranean Sea, on the promenade in Nizza,¹⁰ as well as in San Remo and other places of the Riviera. Here we find the glistening surfaces of the water reflecting the sun-rays, and the background is formed by high mountain walls. In some localities in California, at the sea, for instance, in Santa Barbara, similar conditions exist. Such localities are most favorable for sun-baths. I know from my own experience what a difference it makes to take a sun-bath in Leysin, or on a plain in our own regions. A damp, hot summer day is surely inappropriate, and can only do harm. The most appropriate time is during the forenoon hours, when the sun is not yet too hot.

Malgat,¹¹ in Nizza, discovered that there photographic plates, set behind a naked individual, have shown light impressions. The chemical rays of the sun have consequently pierced. On a journey to the North Cape he found that the rays of the

⁹ Lorand, *Old Age*, chapter about the influence of the sun.

¹⁰ Malgat, *l. c.*

¹¹ Malgat, C.-r. de l'Académie de Médecine, 1903.

sun in the north have not shown that faculty. Schlaeffer,¹² on the other hand, observed that after sun irradiation the blood inclosed luminating elements which influenced a photographic plate in the dark. It is to be mentioned, also, that the higher the locality is situated the more ultra-violet rays are present.

Light was tried for treatment in nervous diseases and psychiatry. In some melancholic patients red light acts as a stimulant. We know, by the way, that some animals, for instance the bull, become very much excited on beholding anything red. Blue light, on the other hand, has a very calming effect. Actually observations have been made that excitable patients become very much quieter in cells with blue light, as I have often seen, particularly in French hospitals.

Based upon the above description, I think it would be well worth the trial to place melancholic patients, and particularly idiots and cretins, and all feeble-minded, in a sunny, high altitude. The wards for patients should, however, all be exposed to the rays of the sun.

I would like to add here that Dr. Rollier made some interesting communications to me in regard to the high intelligence of the inhabitants in Leysin. People who never travelled and who almost never absented themselves from the village for any length of time were very well read, and expressed a distinct and proper opinion in regard to political questions and about all that was happening, so that they surprised Dr. Rollier. During the first years of his stay in Leysin he often had occasion to converse with the inhabitants, and to admire their wisdom.

In perfect accord with this is the opinion of Schruppf¹³ about the inhabitants of the sunny Engadin. These are all able merchants, good calculators, and clever men. At the same time they live pretty well apart from the other nationalities, from whom they differ also in their origin. Their language is the Roman, which is very similar to the Roumanian. The intelli-

¹² Archiv für Physiologie, 1906, S. 552.

¹³ Persönliche Mitteilung.

gence of the children manifests itself also by the fact that, besides their own language, they speak also French, German, and Italian. It is significant of the great intelligence of the inhabitants of Engadin that most of the porters employed in the large international hotels come from there. And everybody would surely agree with me, that hotel porters belong to the most intelligent class of men; they all speak a number of languages, and scarcely anyone has such a great knowledge of human nature as the porter of a large hotel. One look is often sufficient for him to size up the internal value, but particularly the *external* value of a man. Engadins are, moreover, found scattered in various countries as rich or well-to-do owners of large business establishments or hotels, often only a few years after they had left their home town without a penny in their pockets. In a similar way the inhabitants of the sunny landscapes in the Pyrenees, the Basques and Catalonians,—they belong to the most intelligent inhabitants of Spain,—become very rich in South America. The Scotch, due of course to the place of their origin, also belong to this category, and, in fact, they are the most prosperous of all nationalities in the United States and Canada.

Lombroso¹⁴ also points out the fact that the inhabitants of the sunny mountains are distinguished by particular intelligence. We think we have given in the above discussion the explanation for this fact.

For confirmation of my statement made above I would now like to add a very instructive, practical example, for which I am under obligation to my colleague Schrupf in St. Moritz. A few years ago a physician from Frankford referred to him a son, who was a high-school junior. The boy was mentally backward; he was always sleepy, could not keep himself awake, would fall asleep in school. He suffered considerably from obesity, and, according to Dr. Schrupf's description, I consider it as a case similar to the one which I described before, namely, a case of sleeping sickness, on a myxedematous base. After a

¹⁴ Lombroso, *l. c.*

stay in St. Moritz for two weeks the boy became more alert mentally, and in a month's time was an entirely different person. He lost fifteen pounds in weight, sleepiness was entirely gone, and the lad became entirely changed; he became mentally very much alive. Whereas he was mentally so weak that he had to be sent to St. Moritz under escort, he was able to make the journey home alone, through difficult routes at that. After his arrival home he sent Dr. Schrupf some very humorous letters. Two years later he graduated successfully from school.

This favorable effect of the climate of Engadin upon backward children has led to the establishment of a gymnasium for just such children in Zuoz, near St. Moritz; tuberculous children are excluded. The establishment of this institution was brought about by the observation made that visiting children, when they stayed in Engadin, developed surprisingly well, not only bodily, but also mentally. The reason for this may, after the discourse above, be found in the favorable effect which the sunny climate of high altitude has upon the activity of the thyroid gland.

CHAPTER XXVII.

HINTS IN REGARD TO THE BEST POSSIBLE UTILIZATION OF SUNLIGHT, AND HOW TO CARRY OUT SUN-BATHS.

AFTER the discussion in the previous chapter it would seem of the greatest advantage to be exposed as much as possible to the rays of the sun, if they are not too hot. The sun penetrates everywhere where unwise men put no obstructions in its path; it shines upon the high and low, the count and the beggar; its rays penetrate into the palaces of the rich and the hut of the poor, and also through the gaps in the cellar dwellings of those disdained by fortune. Wherever they reach they destroy the injurious living organisms. The latter we find everywhere,—mostly, however, in dark dwellings, particularly when they are not situated in a high locality. We see, therefore, in large cities the inhabitants of the dark dwellings deteriorate, bodily as well as mentally. Rheumatism and tuberculosis, particularly of the bones, are very common among them. Among the children of these inhabitants most striking degenerations of the thyroid are frequently found, as, for instance, congenital myxedema. Here also the alcoholism of the fathers, which occurs so often, plays a part. It is no wonder, therefore, that these children, who are also poorly nourished, become backward in their studies, and in most instances do not advance further than their fathers. In a modern State to each citizen should be given a certain portion of sunlight. The State does not lack for compulsory measures; why does it not use them to close up those cellar caves, which infect the body and mind, as well as those workshops where the laborer has to work all day in bad air, from which the sun and the light are excluded? A simple calculation should show those in charge that by so doing the State would save countless millions of dollars spent for the support of hospitals, insane asylums and prisons. All States would be very

much better if they followed the example set by the city of Budapest, and built, at public expense for the people, apartments and dwellings with all the sunlight possible. Thus millions could be saved at the expense of one million. It is the duty of the State to take a fatherly interest in and care of its people, both in regard to their mental and bodily welfare.

First of all, every man should see that he has a dwelling which has much of the sun daily. If that, as it happens so frequently, has to be renounced in a large city (the exodus of the people from the country into the large cities, which I have condemned in my book on "Rational Diet," herein plays a great part), one should attempt to have a high location for a dwelling, because there the air contains less bacteria. It is remarkable that, particularly in the south, at the Riviera and in the southern part of the Tyrol, rooms with southern exposure are looked for; and in the large cities, where it is needed still more, no value is attached to it. In the southern parts of Tyrol, with its balsamy air, the rooms with a northern exposure, if they are only one or two stories high, have few bacteria, but, of course, the rooms with southern exposure, well exposed to the sun, contain the least.

Unfortunately, we find people who prefer to have curtains in their sunny dwellings to prevent the health-giving May sun from entering them. We also see, even at the Riviera and in Meran, people of apparent intelligence foolishly walking around in deep-black clothing in the sunshine; in this way they find their clothing very hot, but do not let a single ray of the sun pass through it. Attention should be called in public lectures to the immense benefit of the sunlight to the bodily and mental welfare; it is the friend of man, instead of his enemy. It is the southerners, strange to say, who, able to benefit by the strongest sunlight, are just the ones to fear it most, and who tightly close up their houses from the sun, even in the mild spring. Another extreme we find in the well-known fear of the cold by the northlanders, notwithstanding the fact that they have to

stand it the most. They heat their homes extensively, early in the fall, before the cold sets in.

In the south, where the sun is very warm in the spring, and in our regions during the warm months, when the sun shines, we must, therefore, endeavor, by wearing very light, porous clothing, of white or light-gray color, to absorb as much of the sunlight as possible. Some of my colleagues in Carlsbad consider me a "queer fellow" because I cannot bring myself to walk around during the summer, in the warm, bright sunshine, with a black dress coat on, as they do, but prefer to be dressed in light-transmitting white or gray suit. And when they interview me about it I tell them it is because I am sorry for myself and for the black material of the garment!

Those who want to absorb much sunlight during the winter and spring may go to the south or to the high mountains in the Tyrol, the Tatar mountains, and to Switzerland. As mentioned before, the sun rays are the purer, and contain the more chemically active substances, the higher a location is situated in the mountains. Such places should be preferred which are surrounded on all or several sides by naked, high, rocky walls reflecting the sun, as, for instance, Meran in the southern part of Tyrol, or where there is a mirror of water on one side and high rocky walls on the other; or the entire location is situated by the sea, such as Nizza, Nervi, or other places in the Riviera. Places situated high in the mountains and with snow-covered plains on one side and high rocky walls on the other would be preferable, but they have the disadvantage that excursions can be undertaken only in the snow, and this prevents taking daily distant tours on foot. For hygienic sun-baths, however, such localities are most suitable. It is directly injurious to take sun-baths in damp, warm localities, during the height of summer. Dry air is best suited for this purpose. Otherwise the heat rays are mainly active, excessive perspiration sets in, and after that one frequently feels very much exhausted and tired. For hygienic reasons, it is not good to take such baths for sweating

purposes daily. Sweat-baths are beneficial in cases of gout or colds, of obesity, but then, too, they must not be taken daily, but every other or every third day. A sun sweat-bath once or twice a week is also good for entirely healthy persons, because in this way a number of substances, injurious to the body and mind, are removed. Hot baths and sweat-baths are usually administered in mental diseases, particularly in maniacal exaltations, because they promote the blood-distribution in the body, relieve the congestion of the brain frequently present in such cases, and remove the toxins. In view of the fact that the sun-baths, even when perspiration does not take place, by irradiating the whole periphery of the body, further the circulation of the latter, and thus drain off the blood from the brain-cortex in case of congestion; they can be used daily for a more or less long time, depending on the warmth of the rays. As soon as one feels warm and perspiration appears, one should stop. The sweat-bath itself should be taken once or twice a week. Such a sun sweat-bath is the most hygienic and most ideal sweat-bath there is. During it one has, first of all, pure air; the mucous membranes do not become as dry as is the case during a sweat-bath by dry heat or even a steam-bath. If it is, however, overdone, it may become very injurious to the heart, and to the nervous system. If it is taken in excess in tuberculosis, very bad results may follow. In anemic, chlorotic patients, it is also necessary to be very cautious. Neurasthenics may become very badly exhausted by such baths and, instead of increasing the activity of the thyroid, it is rather reduced by exhaustion, the same as in excessive thyroid treatment, with which the sun treatment is greatly analogous. Mental activity, pleasure in working, and the power of judgment can be considerably promoted by profuse, not too hot, sun irradiation; they may be weakened, however, by excessive and frequent sun sweat-baths.

Sun-baths, as well as any other warm baths, should not be taken with a too empty or a too full stomach. They should not be taken, therefore, directly before and also not directly after

the main meal. During the summer, a dry place, which is very much exposed to the sun, is the best. On very hot days, the morning hours only should be used. Generally, but not always with good judgment, sun-baths are taken on the beach of a stream or a river, where damp heat is dominant, which, during the summer months with their excessive heat, is not without its disadvantage. The advantage is, however, in the fact that one may be undressed. It is possible, however, on the roof or in the garden, protected from wind, and best with a white wall as a background, which reflects the rays, to take a sun-bath even in the face of the neighbors, by lying in the sun, dressed in light, airy, thin, white clothes. In Leysin, at Dr. Rollier's, I have seen children lying in their white beds on the porches as long as the sun was low during the early morning hours. The sun penetrates easily through white dresses. In the sun everyone should wear white clothing, and the ladies should not have black, but red or white umbrellas. The uncivilized inhabitants of hot climates are instinctively dressed in white. This is also the color of the Howas in Madagascar, and of the Abyssinians and Arabs. The Bedouins are also clothed with dazzling white wraps. All knowledge which these nations possess is based upon their experience, and the latter taught them the excellency of wearing white garments in the sun. Only the highly educated Europeans stand below them, as in so many questions of human sound common sense. They walk around with black clothes in the most brilliant sunlight.

CHAPTER XXVIII.

FURTHERING OF MENTAL FACULTIES BY MEANS OF CERTAIN DRUGS.

A DRUG can increase mental faculties only when it exercises a favorable influence upon the circulation in the brain. From the observations of a number of investigators, particularly from those of Mosso, Wagner, Gärtner, and chiefly from the painstaking work of E. Weber, we know that various drugs act in that way, as, for instance, the fever remedies, such as anti-pyrin, and also caffeine. They produce a dilatation of the blood-vessels of the brain-cortex and hyperemia in that organ. May not the good-humor, the particular feeling of well-being, the euphoria so often noticeable after taking these remedies, have some direct connection with that hyperemia? I consider it probable, because we know from the investigations of E. Weber that sensations of pleasure go hand-in-hand with hyperemia of the brain, and sensations of displeasure with anemia of that organ. We know, on the other hand, that a pleasant good humor is an essential requirement for mental work. After taking caffeine in tea or coffee one feels mentally stimulated thinking and mental work become easier. Weber,¹ it is true, found that after a certain time hyperemia is followed by anemia. I consider it, however, quite possible that this is only the case when larger doses are taken, similar to the effect of fever remedies upon the temperature, whereas smaller doses act as stimulants, irrespective of the fact that some investigators have never observed any subsequent anemia. According to my observations, salicylates and the salicylates containing aspirin have the same effect. Euphoria sets in and the flow of thoughts becomes easier, as anyone may experience in himself if he has

¹Weber, *Der Einfluss psychischer Vorgänge auf den Körper, insbesondere auf die Blutverteilung.*

taken some of the salicylic preparations, and does some mental work two or three hours afterward. These remedies cannot be used, however, purposely for that, because the daily regular use of them would injure such important organs as the kidneys.

That it is possible to produce a favorable influence upon the circulation in the brain by means of drugs is also shown by the conditions existing in migraine and scintillating scotoma. It is generally accepted that these latter are caused by changes in the blood-circulation of the cortex. When we use a remedy which has a strong effect upon the latter, such as amyl nitrite, we may succeed in checking the attack or curing it. In the same way, quinine, or strong coffee or tea, may affect favorably a glimmering scotoma. According to my experience in several cases, the inhaling of ammonia may also check a glimmering scotoma in the beginning of the attack; if the remedy is used immediately it prevents the development of the so-called fortification spectrum. Ammonia may possibly produce a modification in the blood-circulation of the brain by strongly exciting nasal secretions. That this kind of connection surely exists is best proven by the fact that in case of a fainting spell, consciousness is restored by inhaling ammonia. According to my observations, the inhaling of ammonia, the smelling salts of the English, can also produce a good effect in a lack of desire for work, dullness in the head, in great mental exhaustion after protracted mental activity, also in conditions of depression following a sleepless night.

That there must exist remedies which have a beneficial effect upon the mental faculties may possibly be concluded from the fact that there are other remedies with an opposite action, having a very deleterious effect. This can often be observed in the mental stupidity of persons who were previously very intelligent,—I have seen many such cases,—after the protracted use of remedies for insomnia. This is very conspicuous in persons who have taken bromides for a long time; for instance, in epileptics. We, first of all, see a striking weakness of the memory;

the patients are unable to keep anything in their minds. There also exists slowness of thought; they have to think for a long time before answering any question. Among the remedies acting in an opposite way we can consider, first of all, preparations made from organs which we will consider later; and then, possibly, the above-mentioned antipyretics; also caffeine and beverages containing the latter. Of course, it is possible to partake of coffee or tea every day and utilize the stimulating condition which follows it for mental activity. I consider it, however, not a hygienic method when healthy normal men partake every day of strong coffee or tea to increase their ability for mental work. This should be permitted only occasionally, when one is tired and exhausted and some mental work is to be done which cannot be delayed. More hygienic than the use of coffee or tea is the use of maté, a variety of tea imported from Paraguay and Brazil, the properties of which I have already described in another of my books.² According to several reports published lately by French investigators, this tea acts in an accelerating manner upon the blood-circulation, and also affects the tired feeling following muscular exertion. At the same time, it lacks the exciting effects of coffee or tea, and, therefore, could be used as a drink during mental activity in nervous individuals, instead of the very dangerous alcohol or coffee and tea.

Among the remedies which have direct effect upon the mental faculties, and at the same time can be taken daily at regular intervals, may be mentioned the animal thyroid. It seems to me not improbable that in producing this effect a drug substance participates, which is a constituent part of the thyroid and that is iodine. This substance has a long-standing reputation for having a distinctly favorable effect upon the blood-circulation. According to Ottfried Müller and his pupils, it is particularly characterized by its reduction of the viscosity of the blood, and thus facilitates circulation within the arteries. When we think of the narrowness of the minute blood-vessels in the brain-

² Lorand, Rational Diet, etc.

cortex, then a remedy which diminishes the viscosity of the blood in that locality must appear as being of great importance. It is true that the statement, that iodine reduces the viscosity of the blood, has not been generally accepted by all investigators; and this also holds good in regard to the view expressed by Huchard, that it dilates the blood-vessels and reduces the blood-pressure, but, nevertheless, every-day experience on many patients with arteriosclerosis teaches us that under the use of iodine these patients feel very well, often extremely so. I have also noticed particularly how often a reviving of the mental faculties has taken place. I have often treated old gentlemen with arteriosclerosis of the brain-vessels, who complained of headaches, dizziness, and pressure in the head, who had been entirely unable to think; they did not notice anything and had manifested a conspicuous weakness of memory. After a two to three weeks' use of iodine, they have shown a real change. The pressure in the head disappeared, thinking became much easier, and when questions were asked they were able to think over them without difficulty, whereas this was a hard task for them before. The memory was also very much improved, and they could retain much more easily in memory what they were told. In view of this favorable effect of iodine in cases of arteriosclerosis of the brain blood-vessels, may be raised the question, whether it would not be more rational to begin with this treatment at a time when the condition is not as yet developed? From the clinical standpoint, I consider it more appropriate to begin with the iodine treatment as soon as the first signs of inclination to arteriosclerosis become apparent. The whole expression of a person sometimes shows a tendency to it; for instance, the full-blooded, plethoric look, red color of the face with great dilation of the small blood-vessels; first of all, a condition of frequent elevation of blood-pressure or continuously approaching the upper maximum limit of the normal blood-pressure, or even getting above it. In addition there is a tendency to constipation and to changes in the function of the kid-

neys, the appearing of traces of albumin, and particularly of formed elements of the kidney in the urine. The danger is most threatening, however, when we have to deal with very nervous persons with frequently fluctuating blood-pressure; and, above all, with those who frequently overexert themselves mentally. It is my opinion that Romberg's³ observations, according to which sclerosis shows itself particularly in those blood-vessel regions where overwork, with too great blood congestion has taken place, as, for instance, in the extremities of persons doing very much physical work, finds also its expression in the blood-vessels of the brain. That the brain-vessels become overfilled with blood during mental work we have already noted. At any rate, it may be mentioned in this connection that, as was already stated in other parts of this book, conspicuously great men, geniuses, the great thinkers, very often have suffered from arteriosclerosis, and very often apoplexy was given as the cause of their death. When, therefore, the symptoms named above become manifest and mental exertion is taking place; and when, in addition, there is associated the two main etiological factors of arteriosclerosis—(1) syphilis, from which the patients have formerly suffered; (2) excessive smoking—treatment with iodine should not be deferred until arteriosclerosis is fully developed, but should be instituted at once. Here, also, is the golden saying justified, "An ounce of prevention is worth a pound of cure." Treatment should be begun in such candidates for arteriosclerosis before the typical manifestations on the heart and blood-vessels have taken place. If we assume that iodine, by its favorable effect upon the blood-circulation, is of avail in fully developed arteriosclerosis, then it may act as a preventive in not yet fully developed cases. Small doses would suffice here, as in the fully developed disease also small quantities are sufficient. I have shown in my previous book⁴ that iodine is of most assistance when it is given in not too large

³ Romberg, *Die Arteriosklerose*, Leipzig, 1898.

⁴ Lorand, *Old Age*.

doses, and I made there the remark that iodine, arsenic, and many other drugs act upon the various tissues and the injurious minute organisms within our bodies, not directly, but indirectly by increasing the activity of certain organs of defense, the ductless glands. This is also very clearly seen, for example, from the failure of the sterilisatio magna in syphilis with salvarsan. The Erlich-Hata remedy produces, in an indirect way, an increase of the reactive ability of the organism against the spirocheta, but does not directly kill the latter, as they remain entirely undestroyed by this remedy *in vitro*. The same is surely the case with iodine, and I have already pointed out⁵ that its effect is not a direct one, but affects the thyroid gland, which contains iodine; and, indeed, contains most of the iodine in the body. For that reason I, as well as others, have recommended in the treatment of arteriosclerosis that iodine be used only in moderate quantities, because these stimulate the thyroid best to higher activity; larger doses, on the contrary, according to the experiments of Garnier and others, may cause exhaustion and underactivity of the thyroid. I see, moreover, from the literature of recent years, that the administration of iodine in moderate quantities in contrast to the administration of large doses formerly given has been accepted by most of the clinicians.

Another remedy, phosphorus, in form of various organic compounds, has, according to observations of various authors, some of which are very trustworthy, yielded very good results in rachitic children with deficiency in the brain function. The children have manifested higher efficiency in school requirements. I consider it as quite possible, but it is necessary that those ductless glands which have to regulate the consumption of the phosphorus in the body economy, first of all the thyroid, the sexual glands, and hypophysis, should be in good working order. In accordance with my theory mentioned above, drugs exercise their effect in our bodies only in a round-about way, through the ductless glands, which regulate the immunity and metabo-

⁵ Old Age.

lism, particularly, however, through the thyroid. Now, one could introduce into the body as much phosphorus and calcium as one wants without any consequence to our bodies, like into a bottomless pool, if care be not taken that the activity of these glands is not at the same time stimulated and kept in good order. These glands are the ones which take care of the retention and utilization of these mineralized substances which are so important for the nutrition of the central nervous system. Treatment at the same time with animal thyroid is the more indicated, because, as a rule, children and adults who need phosphorus and calcium also show signs of weakness of the thyroid, and frequently also of the sexual glands.

CHAPTER XXIX.

IMPROVEMENT OF MENTAL FACULTIES BY THE USE OF EXTRACTS FROM ANIMAL ORGANS.

THAT drugs do actually exist, the effect of which is to considerably increase the mentality of a man, can be proven in an indisputable way by the favorable results obtained with thyroid treatment in stupid cretins, and also in idiotic children. We see how such creatures on the lowest plane of intelligence; nay, even in their appearance and behavior approaching the animal, will, under the influence of such treatment, assume a more human appearance; and, whereas, they formerly expressed their wishes by barking and making inarticulate sounds in animal-like manner, begin to make themselves understood by speaking. It should be taken for granted *a priori* that a remedy that does such wonderful things in those entirely deprived of reason, transforming them into intelligent creatures, will produce very good and, possibly, even better results in individuals who are not of so low a mentality. That this is actually the case can be seen from the fact that the various forms of thyroid weakness may be favorably affected. We have already said repeatedly that between the condition in which the thyroid is entirely inactive—namely, myxedema and those conditions in which the gland is intact—there are a number of transitional grades. Of children who suffer from simple inactivity of the thyroid,—the simple benign weakness of the thyroid (Hertoghe),—there are surely many thousands in existence. In this category belong the numerous children who are offsprings of alcoholic, syphilitic (first and second generations), tubercular, and malarial parents, or of such who have suffered from other chronic cachectic diseases. The mental signs of such inheritance (diseases accompanied with fever may often also injure the thyroid) are of various kinds, beginning with animal-like stupidity up to slight

mental deficiency, the inability of calculating and forming conclusions. The signs of the mild form of thyroid weakness are often only slightly manifest; frequently the diagnosis is, as Hertoghe justly says, only to be made by examination of the parents. Frequently the children remain behind in their growth, and if, in addition to this, they do not make good progress in their studies, the diagnosis is then justified. The condition of the teeth may also speak a very expressive language. In grave cases diagnosis is, at any rate, made clear by the degenerative processes in the jaws with the irregular arrangement of the teeth in form of steps; in mild cases the teeth often remain undeveloped; they are injured very easily, and are most susceptible to caries; in the same way the tissues of such children, in general, manifest but very little resistance to inroads of infectious diseases. Very often in such children are found swollen lymph-glands and the lymphatic habitus in general; they are also predisposed to scrofula and tuberculosis. In most instances they are pale and delicate. I have often been consulted in regard to thyroid treatment by parents whose children remained stunted in their growth; that the children had not progressed mentally had not been noticed by the parents. How surprised the parents were when, after the treatment, a more rapid growth took place, and the children at the same time became much brighter and brought home from school better reports. Such rapid and surprisingly good results have been published by Hertoghe from Antwerp; he also found that the children made better progress in spelling and grammar, and also in arithmetic. It is my opinion that in all cases where the children show a conspicuous absent-mindedness, laziness, and inability to remember anything, a cautious trial of thyroid treatment should be made. While, as already stated, the condition of thyroid weakness, either congenital or acquired through various causes, particularly through fever diseases, may be recognized externally by typical symptoms,—first of all, that of retarded growth,—cases are, however, not rare in which the symptoms are very little or not at all pro-

nounced. In the infantilism type—Lorain—there are even children who grow very well, but they are delicate, and mostly make no particular progress in school.

A particular symptom of thyroid weakness is undeveloped sexual organs, and in older children non-development of secondary sexual characters. It is very important that treatment should be begun early, and that the children should not be allowed to reach puberty without having tried it. If a weakness of this organ, which regulates metabolism, blood-formation and blood-circulation, is present, and it has also affected very much the other ductless glands which regulate these functions, then the metabolism of the central nervous system and of the brain-cortex especially also suffers. The fact that children retarded in that direction become greatly stimulated in their growth after the thyroid treatment shows distinctly that this gland regulates the consumption of important component elements in the brain-cells, namely, phosphorus and calcium. While using thyroid tablets, these substances are better utilized if they are introduced into the body in conjunction with the food, as is described in various parts of this book. By increasing the metabolism, the brain also becomes better nourished with blood containing much oxygen. That the thyroid has a favorable influence upon the blood-formation, and that by the use of the thyroid tablets the number of red blood-corpuscles and the blood-circulation are increased we have already mentioned. It is possible to easily observe how, under the influence of such treatment, the number of pulse-beats, the height of the temperature, and the quantity of urine are increased. As an example of such a distinct effect of the thyroid upon the blood-circulation and the quantity of urine voided I will mention here two cases which I have observed in the clinic of Professor Pel in Amsterdam.

For the permission to use the following tables I am under great obligation to Dr. Pel.

THYROID TREATMENT.

Miss L.

Started on November 12, 1912.

Date.	Pulse.	Temperature.	Quantity of Urine.
November 18	72	36.6°	1200
“ 21	78	36.7°	1500
“ 25	76	36.9°	1900
December 2	80	37.0°	1500
“ 11	84	36.8°	1300

ADMINISTRATION OF THYROID.

Miss V.

Started on November 5, 1912.

Date.	Pulse.	Temperature.	Quantity of Urine.
November 5	74	36.4°	1900
“ 8	88	36.9°	2800
“ 11 ¹	84	37.3°	1100
“ 14	90	37.3°	1200
“ 16 ²	76	36.9°	1800
December 6	77	36.7°	1800

We thus see that after the administration of thyroid had been interrupted the pulse and the temperature went down again, and that the effect subsided only gradually, and disappeared only several days afterward.

It is clear that a remedy which produces such action in a depressed condition of circulation and metabolism, as is noticeable, as a rule, in persons with a weak thyroid, may also have a mighty influence in increasing the development of the central nervous system, and also of the brain-cortex. It is evident that it would not be wise to delay the treatment until the brain-cortex has developed abnormally, and irreparable changes have taken place. It must be anticipated, and the treatment begun very early. Thyroid tablets should be administered to the mother during pregnancy, or during the lactation period, if she manifests any signs of thyroid weakness. It is a positive fact, as

¹ Last day of using thyroid.

² Thyroid not used for five days.

shown in my previous publications, that the substance of the tablets pass into the milk. Children with congenital weakness of the thyroid also show no symptoms of that condition as long as they are receiving their mother's milk, and they manifest the symptoms only after they have been weaned.³

It would be very appropriate to begin the treatment while the children are small, at the age of three to four years, or even still younger. Of course, the backwardness in mental faculties may often be recognized when the children begin to go to school, or even in the kindergarten. It could readily be recognized during the plays, which are mentioned in the chapter on sense exercises, as, for instance, in recognizing colors, correct sight and the sense of touch. A trial with thyroid treatment may be all the more readily made, because it is harmless when it is done cautiously, and the quantity of the thyroid given is small.

Based upon my own experience in numerous cases I can state that I have never seen a skillful treatment ever having bad consequences. It is interesting to observe how first the exterior of the child changes: first of all, a rapid growth takes place, and in conjunction with these changes in the exterior, but, as a rule, somewhat later, an improvement in mentality becomes apparent. I have observed how previously entirely indifferent children became inquisitive, began to take interest in various things, and to ask questions about them. Soon a distinct improvement in school-work was noticed; the children made better progress in the branches in which they had before been lacking, even if only within the limits of their natural capabilities. In some children who had been wetting their beds I have observed an improvement in that respect; this was discovered before by Hertoghe.

While the best results are obtained in children, effects of thyroid treatment may be observed in adults also.

Wagner von Jaueregg⁴ was able, as mentioned in another

³ Lorand, *Old Age*.

⁴ Wagner von Jaueregg, *Handbuch der Psychiatrie, Myxœdem und Kretinismus*. Leipzig und Wien, 1912.

part of this book, to obtain distinct improvement of the mental condition by means of thyroid treatment in cretins who were more than 20 years of age. That we can obtain good results also in adults is already seen from the fact that in the fully developed forms of degeneration of the thyroid, in myxedema, according to the coinciding observations of numerous authors, the mental condition may be markedly improved. The previously apathetic patients begin to take interest in their environment; the inertness which is so marked in them, and which expresses itself by their remaining in one position so long at a time, gradually disappears, and they become very active. I would like to point out further the noticeable improvement of their memory. But here also the same rule applies as in children, that the prospects for improvement of the mental stupidity are best before the disease in its course, which lasts many years, has reached an irreparable stage, and changes have already taken place in the thyroid as well as in the brain-cortex. Very favorable results may also be obtained in the not fully developed cases, in the simple weakness of the thyroid, as it was first stated by Hertoghe, and afterward by myself, which was based upon a large number of cases. I have, in particular, been able to make observations on the effect of thyroid treatment in numerous women during the climacteric, and in the period after it. Very often these were women who had taken thyroid treatment under my direction to correct obesity and other manifestations caused by changes due to age. After several weeks' treatment obesity disappeared, and, at the same time, I was able to observe that the women, who had appeared dull previously, were very much improved in their mental condition; they became much brighter. The great fatigue disappeared, and the patients who before had no interest in anything had become interested in all around them. Their ability to notice things around them had increased very greatly, and they could remember the things which they would readily have forgotten before. In some of them, who had in former years been mathematicians, but had

entirely lost that faculty, I could observe that, after three weeks' treatment, they were able to multiply in their minds one two-digit number with another very much more quickly. The trend of thought was also much faster, as they could find the appropriate words to express themselves during conversation. The improvement in mental vivacity was unquestionably present, and the same observation was made by others after thyroid treatment.

As an interesting counter-example of the question here under consideration, I may mention that, just as treatment with thyroid increases the mental faculties, so, on the other hand, blood-extracts from animals, from whom the thyroid was removed, exercises a contrasting effect. This was established in persons who were treated for Basedow's disease with anti-thyroidin of Moebius. Dürig has observed,⁵ for instance, in a patient, after the treatment with that remedy, a stupidity, a weakness of memory and sluggishness in thinking, which only disappeared when she stopped taking the remedy.

I would now like to suggest the following questions: If the treatment with thyroid in cases of inactivity or degeneration of the thyroid and in low mentality renders such good results, could it not be possible in a case of a normal thyroid, and of normal mental activity, to increase the latter? In fact, Hertoghe has been able to observe often upon himself a stimulation of the mental faculties by taking two or three thyroid tablets at once before delivering a lecture.⁶ I can also confirm his, from observation upon myself while taking thyroid for many years for experimental and studying purposes, that when I felt exhausted after long hours of work, and took two tablets at night, I felt much more refreshed the next morning, and felt much more pleasure in working. I want to emphasize particularly that the thyroid tablets have, in my opinion, the faculty of producing a better spirit, and, consequently, more joy in working. That the

⁵ Dürig, *Münchener med Wochenschrift*, 1908, Nr. 18.

⁶ Verbal communication.

thyroid is a stimulant for the brain-cortex has been, by the way, expressed years ago by the English psychiatrist Clouston. This increase of working ability, after the thyroid treatment, I have been able to observe very often in neurasthenics, with symptoms of depression, in whom an improvement of the nervous condition with a more cheerful disposition and a distinct desire for mental work took place, which found its application in carrying on correspondence, and in much reading. Very conspicuous was the improvement of the memory. Words in foreign languages, which were forgotten for a number of years, came back to memory once more. That the thyroid treatment may produce such good results in this kind of cases cannot surprise us if we take into consideration that, according to a number of authors, it even rendered good results in cases of mental diseases, such as melancholia and dementia præcox. In melancholia I have observed improvement in many cases myself, after a combination of treatment with thyroid and ovarian extracts.

Notwithstanding this favorable influence of the thyroid upon the desire to work and the disposition, I would consider it proper to try its effect only in cases where a weakness or an inactivity of the thyroid is to be corrected. To take thyroid daily for some time in order to increase the quality of the mental work would seem to me only so much more of a mistake, as in persons with normal thyroid an overactivity of it is produced, and this may cause very undesirable effects in the nervous system, and in the circulatory apparatus. The thyroid is, like all other effective remedies, surely not a harmless one, and in the hands of untrained laymen it is often a dangerous weapon. In view of the fact, moreover, that these undesirable symptoms, as a rule, become manifest only after it has been used for a longer time, and in larger doses, frequently also only after the use of preparations of doubtful quality, a trial with thyroid treatment would be worth while in all cases where, in children and in adults, there is found a conspicuous laziness, absent-mindedness, and a lack of desire for work, lack of conversation,

marked weakness in concentration and memory. If observation of the pulse and the heart activity is made every third day, it is possible to carry out these treatments without any difficulty, as I have seen in the course of years, in hundreds of cases. At any rate, I consider it necessary to undertake such experiments *only when signs of deficiency in function are manifest in the thyroid, and also in the body.*

In girls who (as it is often seen in children who are making slow progress in school) show signs of insufficient development, undeveloped female sexual characters, absence of menstruation after puberty, I consider it wise, according to my experience, to give, in addition to thyroid, also animal ovary. It is often possible to observe that, after the treatment with thyroid alone, sexual development progresses; in girls menstruation sets in, and often the breasts develop much better; in boys a descension of the testicles takes place, in case this had not taken place before. It is interesting to observe how, in conjunction with this also, a marked improvement in the mentality sets in, thus manifesting the close relation which exists between the function of the sexual glands and the intelligence. The administration of extract of ovaries can give excellent results also in nervous complaints of women during and after the climacteric, and the disturbances of mental faculties caused by it.

V. THE POWER OF THINKING, AND RATIONAL THINKING—THEIR DEVELOPMENT, PARTICULARLY BY PRACTISING THE SENSES.

CHAPTER XXX.

THE SEAT OF THINKING POWER AND THE PROCESS OF THINKING.

WHEN in a human being or an animal the large brain is destroyed or removed by an operation, a very great change takes place in his mental and spiritual deportment.

An almost total loss of all the experiences undergone takes place, and remembrance of all past events are blotted out. Such a man, or animal, may retain the faculties of sight and hearing, but cannot recognize what is seen or heard. As, for instance, in a dog, from which Goltz¹ removed the larger brain, it was possible to observe that the animal was not frightened even by the most threatening gestures; it did not recognize them. Just as slight was the reaction to caressing. When the animal was pinched it barked or grumbled, but never had an idea of biting; in short, it had no feeling. It always ran around without any definite plan, which expressed its entire lack of will-power.

If the same operation is performed on a chicken or pigeon, and the animal is set on a hot stove, it would sit alternately on one leg and then on the other, but never make any attempt to fly away. They pick up the seeds, but never swallow them, and, therefore, it becomes necessary to feed such birds by force, otherwise they would soon die.

Sometimes, very rarely however, there occur human monstrosities in whom the large brain is absent. Of such a case Monakow² reported that it presented the highest grade of

¹ Goltz, *Archiv für die gesamte Physiologie*, 1892, S. 140.

² *Gehirnpathologie*, II Auflage. Berlin, 1905.

stupidity. This creature could not speak a word; it was entirely blind, and all extremities were paralyzed. When it was hungry it expressed it by roaring; feces and urine were eliminated under it. In such animals or human beings it is, therefore, impossible to speak of intelligent thought.

According to the experiments made it seems that the front part of the large brain—the forebrain—plays the most important part in the process of thinking. This is the locality in which changes are found most frequently; first of all, in most cases of mental diseases, particularly in the gravest form, paralytic insanity; and the changes take place, according to Bolton,³ first in the outermost end of that region. In congenital imbecility it is, again, according to the same author, this part which is undeveloped. On the other hand, Ziehen⁴ has found in microcephalic idiots the forebrain often relatively better developed than the other lobes.

In tumors of the brain or in softening processes, which are localized in this part of the brain, it is very often possible to find that during life a mental breakdown existed.

If in animals the forebrain is removed, very important changes in their mental behavior may be observed; they often become malicious. Their nature seems to have changed still more than the mental faculties. Occasionally similar observations may be made in man. As, for example, Professor Winkler reported to me the case of a gentleman in whom Sir Victor Horsley had removed the forebrain on account of a tumor. The intelligence did not seem to be diminished, but distinct changes in character appeared. It, nevertheless, belongs to the great exceptions when loss of the forebrain does not produce great defects in the intelligence.

If we want to appreciate properly the great significance of this part of the brain for our thinking ability, we must compare

³ Bolton, Goulstonian Lecture, March 1, 1910.

⁴ Ziehen, Leitfaden der physiologischen Psychologie, Jena, 1911, Seite 215.

its fully developed form in man and intelligent animals with the size of this region in animals of low intelligence. Whereas, in the latter, it is hardly developed at all; in man it is of great importance, being about 30 to 40 per cent. of the entire part of the large brain.

In animals where the forebrain is greatly developed, we, *as a rule*, also find higher qualities of the intelligence. So we see in ungulates an enormously developed forebrain, richly grooved with numerous convolutions. And to the classes of hoofed animals, in fact, belong some of the most intelligent animals, such as the horse, the elephant, the pig. That the latter is more intelligent than is usually assumed, and that it is even *capable* of being *well trained*, I have already mentioned in my book on "Old Age." In the Central Institute for Brain Research in Amsterdam, I saw a brain of a giraffe in which I admired the beautiful structure of the forebrain, but I am unable to give any details about the mental qualifications of that animal.

The dolphins have a large and very much convoluted brain with well-developed hemispheres, and they are actually very intelligent. In the Aquarium at Brighton, Saville Kent observed such animals, which already, on the second day after they were taken in, ate from the hand of the keeper and allowed him to caress them in a manner similar to a dog.⁵ Dolphins are also very inquisitive. The males protect the females, and the young are given instruction in swimming.

According to the anatomist Rüdinger,⁶ men of low mentality show, on the average, a more simple form and less extended third frontal convolution than those of high mentality; in newborn boys it is larger and better developed than in girls. As a rule, it is better developed on the left side than on the right. In examining the brains of distinguished scientists, particularly of mathematicians, there can be observed a strik-

⁵ Saville Kent, *Nature*, 1873, p. 229.

⁶ Rüdinger, *Ein Beitrag zur Anatomie des Sprachzentrums*. Stuttgart, 1882. Cotta'sche Buchhandlung.

ingly well-developed frontal lobe, particularly the third convolution of it. So did Hansemann⁷ find particularly well developed frontal lobes in the brain of Helmholtz. A strongly developed third frontal convolution of the brain of the great mathematician Gylden, and of the distinguished woman mathematician Kowalewska, is reported by Retzius.⁸ Dwight⁹ noticed in the brain of the mathematician and physicist Chauncey Wright, known as a "general critic," a strongly developed and artistically built frontal lobe. A strikingly immense development of the frontal lobe, with very profuse convolutions, has been found by Rudolph Wagner¹⁰ in the brains of the great mathematicians Gauss and Dirichlet. According to Moebius,¹¹ the front end of the third convolution is the seat of the gift for mathematics, therefore, of highly developed faculties of intelligence.

Goltz, Munk and Grossglicb,¹² and also Monakow,¹³ dispute all relations between the forebrain and intelligence.

From the gross anatomical standpoint, it is not wise to draw valid conclusions in regard to mental qualities of an individual from the external appearance of his brain alone. It may be that with the artistic, somewhat complex form of the convolutions, as shown in those belonging to the European races, can be contrasted the simple arrangement of the convolutions in the forebrain, which are found frequently, or even as a rule, in the native savages of Australia and Africa. So it is stated by Thurnum¹⁴ that the relation of the brain of the Australian, of whose low intelligence we have already spoken in

⁷ D. Hansemann, Ueber das Gehirn von Hermann von Helmholtz. Zeitschrift für Psych. und Physiologie der Sinnesorgane, xx, 1, 1899.

⁸ Retzius, Biologische Untersuchungen, viii u. ix.

⁹ Dwight, Remarks on the Brain, Proceed. of the American Academy of Arts and Science, 1878, p. 210.

¹⁰ R. Wagner, Abhandlungen der K. Gesellschaft der Wissenschaften zu Göttingen, ix, p. 59. Göttingen, 1861.

¹¹ Moebius, Die Anlage zur Mathematik. Leipzig, 1902.

¹² Grossglicb, Archiv für Anatomie und Physiologie, 1895, S. 98.

¹³ Monakow, *l. c.*

¹⁴ Thurnum, Journal of Mental Science, April, 1866.

this book, to the brain of the European is like 85:100. It was also established by Rolleston¹⁵ that the brain weight of the European was 49 ounces, whereas that of the Australian was only 44.3 ounces. In women the brain weight is lower than in men, the difference being approximated at 100 Gm., or more, but whether this will remain the same during the course of centuries is, considering what has been discussed in chapter ii, p. 3, not quite certain. We have set there the intelligence of women in many cases very near to that of the child. It may be interesting to mention that the brain weight of women scientists may be somewhat greater; the brain of Kowalewska weighed 1360 Gm., whereas she was, at the same time, of small, delicate build. The heaviest brain ever observed was found by Van Valsem¹⁶ in an idiot, it weighing 2800 Gm.; and this shows most clearly how improper it is to draw conclusions from the weight of the brain.

In examining the skull and brain of highly intellectual men, as, for instance, of the great composers and artists, there can be frequently seen a very wide and greatly developed forehead. Particularly great is the contrast with the low forehead of idiots. In the latter the development of the forebrain is not rarely deficient, but surely not always so. In grave mental disease we often see an atrophy of the convolutions in that region; it would, however, be wrong to lay down any conclusive rules. We can sometimes find in idiots, as I have seen myself, beautifully developed brain-convolutions in various regions. For instance, Docent Van Valkenburgh showed me in the Central Institute for Brain Investigations, in Amsterdam, the brain of an adult, born blind,—an ophthalmic idiot. On first impression we should have expected to find just here grave changes on the centers of vision in the occipital lobe, but there was nothing of that kind. It was a beautifully developed brain, with the cuneus, gyrus lin-

¹⁵ Rolleston, *Description of the Cerebral Hemisphere of an Adult Australian Male*. London, 1879.

¹⁶ Van Valsem und Lemey, *Festschrift von der Nederlandschen Vereeniging voor Neurologie en Pspchiatrie*, 1898.

gualis and fissura calcarina in best order. Only microscopically were to be seen in these parts a very distinct change in the cells of the polymorphous layer (according to Brodmann) made noticeable by the white stripe of Gennari.

It is generally unwise to lay down any fixed and conclusive rules in medicine, and this is particularly so in the domain of mental diseases. Here the words "always" or "never" can find no application.

While we observe no macroscopic changes in mental diseases, we find microscopic changes so much more frequently if we examine the various regions of the brain-cortex, particularly the forebrain. In favor of the statement, that the cortex is that part of the brain the changes in which most often cause changes also of mental faculties, the experiments of Flourens also testify. The cortex is, therefore, the most important part of the brain; it is the seat of the thinking power; it is the place where all our thinking, our sensations, our feelings, our will, our memory, all our knowledge is localized. Thomasius Willis¹⁷ declared the cortex to be the seat of our memory, and his contemporary, Swedenborgh, located the brain-cortex as the center whereto the impressions produced by our senses are conducted, and from which impulses of the will are sent out to the muscles; and this was based upon his clinical and pathological-anatomical experience in cases of melancholia and epilepsy, and upon experiments on animals. He very clearly expounded the theory, that the cortex is the seat of the sensory and motor activity of the soul: "Substantia enim corticalis est ipsum cerebrum seu sensorium et motorium commune."¹⁸ When, therefore, Professor Neuburger, in Vienna, some years ago, established Swedenborgh's priority in regard to this question, he rectified an old wrong. It is an interesting fact that, before Meynert, Hitzig, and others, Swedenborgh was the first to localize the mental activity

¹⁷ Thomasius Willis, *Cerebri Anatomia*, Amsterdam, 1667, p. 76.

¹⁸ Emmanuel Swedenborgh, *Œconomia Regni Animalis*, Amstelodam, 1671, 1672, iii, 133.

in the forepart of the brain. About 100 years later, in the year 1759, Caspar Friedrich Wolf presented the same theory in his doctorate thesis.

The great importance of the cortex is also shown by the fact that, according to the investigations of Edinger, in animals manifesting the lowest grade of intelligence, the cortex is not developed. I would like, again, to call attention here, as already done in chapter i, to the most particularly rich blood-supply of the brain-cortex, and, at the same time, repeat that only the most important organs and parts of our body are as richly supplied with blood. If, in examining the microscopic structure of this cortex, we compare the gray substance of it with the white substance of the medulla, which differ from one another in their color, we see from the arrangement of the structural elements that the cortex forms the leading part, because it contains the very important ganglia-cells, while the medulla serves more for conductive purposes. The latter consists mainly of centrifugal fibers, which are sent out by the cells to the periphery for innervation of the muscles, and of centripetal fibers, which conduct the various impressions upward to the superior tissues. Besides that, there are fibers passing which connect both hemispheres with one another, and also fibers which connect the various portions of the cortex with one another.

The gray substance is consequently the thinking part, and, therefore, it contains so much blood, which has such a powerful effect upon its function. The white substance is only the executive lower office, which is subordinate to the former, and as such an organ it is provided with a very small amount of blood.

According to Brodmann, in the human as well as the animal brain-cortex there can be distinguished six layers, with a specially characteristic group of cells in each layer. The nerve-cells have two processes, a protoplasmic process and an axis cylinder process, both of which serve for conduction. They branch out like the branches of a tree, and in this way the nerve-cells come in contact with one another. Through the cells are

traversing fibrils, which pass over to the other cells, through the processes. In this way widely distributed connections are established which serve for the transmission and exchange of impressions from one neuron to another. These fine fibrils, which may form quite a considerable network within the cells themselves, have already been described by Max Schultze, but most attention has been given to them and to their significance by Apáthy¹⁹ and Bethe.²⁰ According to Ziegler,²¹ they play a great rôle as a cytological basis for our memory, and all other processes of thinking in general. In the newborn, and also in the individuals in whom certain sense centers are out of commission, as, for instance, in the blind, the nerve-cells can be seen to be more closely crowded together, and the processes are very little or hardly developed. The excellent investigations of Michaelina Stephanowska on newborn mice lead to the conclusion that the processes only develop under influence of sensory impressions. Ziegler points out that a parallelism seems to exist between the beginning of the mental activity and the gradual development of the neurons, and that the activity of the organs of sense exercises an influence upon those neurons which are in a state of development. *From this we can see the great influence which the sense organs and the use of them have upon the development of our intelligence, to which subject we will repeatedly call attention in this book.* The exceedingly great importance of these nerve processes for the mental activity may be seen best from the fact that, when they are destroyed or when they are absent, very important disturbances of the intelligence,

¹⁹ A. Apáthy, Das leitende Element des Nervensystems. Mitteilung der Zoologischen Station zu Neapel, 1897, Bd. xii.

²⁰ A. Bethe, Ueber die Primitivfibrillen in den Ganglienzellen von Menschen und anderen Wirbeltieren. Morpholog. Arbeiten, herausgegeben Schwalbe, 1898, Bd. viii. Derselbe, Ueber die Neurofibrillen in den Ganglienzellen von Wirbeltieren und ihre Beziehungen zu den Golginetzen. Archiv für mikroskopische Anatomie, 1900, Bd. i, 164.

²¹ H. E. Ziegler, La base cytologique de l'instinct et de la mémoire. Travaux de laboratoire de l'Institut Solvay, publiés par Paul Heger, 1900, III, i, 3, S. 1.

particularly of the memory, take place. This interruption of communications between the neurons can be observed in the grave forms of mental disturbances, particularly in progressive paralysis. Of great interest, for us, is the fact that, according to the investigations of Demoor²² and Miss Stephanowska,²³ in the Solvay Institution at Brussels, changes in these processes (pearl-like arrangement, moniliform appearance) have been caused by various sleep-producing remedies, which indeed, temporarily at least, limit or reduce the mental activity, but after their prolonged use these changes often become permanent. All the pyriform appendages, which are found in large number in all protoplasmic ramifications in the normal animal, may also disappear in course of these changes.

Moreover, it has been shown by Querton²⁴ that, in animals sleeping during the winter, the neurons during this sleep present pearly, string-like changes. All this indicates the plasticity of the nerve-cells, and proves that plastic impressions are produced in them by various impulses. According to Ziegler, this plasticity plays a great rôle in memory fixation, of which we will speak later.

When we compare the brain-cortex of man with that of animals, it strikes us that in the latter the cells are crowded more closely together, and are in greater abundance. In the human brain-cortex we see fewer cells with large interspaces between them, but in their place we find a network of fine fibrils, which just serve the processes of linking together the thoughts, the association processes. Just as we recognize the existence of high culture and industry in a State, by its extended network of telephone wires, as, for instance, in the cities of the United States, so it is here. The cells which are most important for

²² J. Demoor, La plasticité morphologique des neurones cérébraux. Travaux de laboratoire de l'Institut Solvay. Bruxelles, 1896, t. i.

²³ M. Stephanowska, Les appendices terminaux des dendrites cérébraux. *Ibid.*, 1897, t. ii.

²⁴ L. Querton, Le sommeil hibernial et les modifications des neurones cérébraux. *Ibid.*, 1898, t. ii.

the higher mental faculties are, according to Golgi and Cajal,²⁵ those which have processes with a rich supply of very fine arborizations. According to Golgi²⁶ they pierce through to the richly supplied blood-surface of the brain, and there enter anastomoses with the blood-vessels. While this statement is not correct, it is, however, certain that the nerve-cells are related with the blood-vessels by means of the supporting tissue, so that a great rôle must be attributed to the conditions of the blood-circulation, and it must have a very great effect. The ability to concentrate attention on one point, the foundation of memory, at any rate, depends so much upon the quantity of blood available to the cells, that too much or too little of it may cause disturbance.

These important cells of Golgi and Cajal are, according to Brodmann, found in large number in the second and third layers of the brain-cortex, the importance of which has already been pointed out by Bolton. The latter has found, by micrometric measurements, that the second layer, which is generally very deep, shows a subnormal depth in various mental diseases. The cells here were also reduced in number, and changed in their structures. As a whole, the second layer is very much thinned.²⁷ In the following, the second lower layers, in the ganglionic layers, we find first the smaller and farther down the larger triangular pyramidal cells. These play the greatest part in transmitting the motor impulses to the periphery. They continue downward in the projection fibers, which go to motor nuclei, then enter the spinal cord, and from there go to the muscles.

Sensory impressions coming from the periphery penetrate centripetally from below upward into the various layers, pierce these, and are transferred to the association cells, where they

²⁵ Santiago Ramon y Cajal, *La textura del systema nervioso del hombre y de los vertebrados*. Madrid, 1899.

²⁶ Golgi, *Der feinere Bau des zentralen und peripheren Nervensystems*, 1894.

²⁷ Bolton, *Brain*, 1910.

receive, so to speak, spiritual recognition, and are assorted according to their significance. Such a sense perception meets on its way an always increasing number of neurons, and when we compare the fine threads which represent these running upward—afferent, inward leading fibers,—with those running downward—efferent, outward leading fibers,—like telephone wires,—it is actually the same as if telephone connection is set in motion by electricity at the telephone central station. This current is transmitted by the fibrils of the neurons (neurozyme of Forel and neurokinesis of Paul Heger), and so communicated to the various centers. The brain-cortex, the seat of our mental and spiritual activity, may, therefore, be compared with a telephone central, which receives a communication, transmits the same, and sends forward the received orders to the subscribers. The brain is, therefore, to use Heger's expression, somewhat like a registrar, a commutation apparatus, and also a transformer. Something like electric currents, therefore, are passing here in various directions. If, by some disease of the brain, a disturbance occurs, as happens, for instance, through hemorrhage in the cortex, and a destruction of the tissue, as in apoplexy, takes place, then the out-stations are cut off from the main central until the disturbance is repaired, and the various centers have taken up their activity again.

The various regions of the cortex serve for different sense perceptions; the occipital lobe for the sight, the temporal lobe for the hearing, the parietal lobe for touch. The experiments of Munk, Ferrier, and others have shown that the occipital lobe, particularly its inferior median part and the cuneus with the fissura calcarina, play a great rôle in the action of the sight. Dogs in which Munk had cut away these parts on both sides became sense blind. In such cases, pictures are taken by the retina, but they are not recognized. No matter how much afraid the dog was of it before, he does not fear the whip any more. He sees it, but does not recognize its significance, and even when a burning object is brought before his eyes he does

not shrink from it. Some high-grade idiots show the same indifference. In the blind, as Donaldson²⁸ found in the well-known case of Laura Bridgeman, an atrophy of the cuneus is found, as a rule, but not always, as already mentioned. There exist in the cortex a number of fields, which control the motor mechanism and the sensory perceptions. Besides these motor and sensory fields, there are supposed to be, according to Flechsig, Campbell, Bolton, and others, still other association fields. Flechsig came to this conclusion through his observation on the development of medullated nerve-fibers, which go to the cortex. He established the fact that first the fibers going to the sensory fields receive their medullary sheath, and the fibers going to the association fields follow only later. In the embryo the latter have no projection fibers; they have, therefore, no connection or transmission downward, but are only connected with one another, as well as with the sensory and motor fields in the cortex.

According to Flechsig, the various impressions which are transferred to us by the senses are conducted to the association fields for assortment, and there the complex conceptions take their origin. The sensory centers are connected with them by association fibers. According to Flechsig, after permanent changes had taken place in the netlike arrangement of cells and fibers, the experiences which we have had and our recollections are stored up in these association fields. He distinguished the following main fields:—

1. Anterior area in the frontal lobe for bodily sensations, effects, etc.; here the ego and the impulses would be localized.
2. Middle area on the median border of the Isle of Reil, for the mental activity.
3. Posterior area located in the occipital and in temporal lobe, for the experience gained by the aid of the organs of sight and hearing.

²⁸ Donaldson, *American Journal of Physiology*, 1892.

The latter area is supposed to be particularly developed in individuals having great talent for music, etc. According to Campbell²⁹ the cortex of the precentral convolution serves for motor impulses; the sensations of the body he localized in the postcentral convolution.

Bolton engaged himself for fourteen years with the question of localizations, and, based upon his studies, he attributes the greatest importance to the outermost end of the precentral lobe. This spot is supposed to serve the most advanced processes of associations. As an argument for the great importance of this spot, he also makes use of the fact that in that locality the cortex develops last. According to Bolton, the pre-central lobe serves for voluntary linking of thoughts. In the grave forms of mental diseases, in which the influence of the will upon the associations of thoughts is lost or diminished, it is just in that location where changes are found.

Taking into consideration all that has been brought forward so far, I would now like to make an attempt to describe, in a practical way, the process of thinking in the frog and in man. When, for instance, a swimming frog happens to meet a rose which fell into the water, the rays of it get to the retina; from there they get to the optic nerve, and then to the corpora geniculata, and finally to the tectum opticum. The frog sees the rose, but as it does not signify to him anything eatable, he passes it quietly by. When, however, a man passes by a garden, and he sees there at the fence a beautiful rose, a picture of it is formed on the retina; this is transmitted farther by the processes of the nerve-cells of the retina (we may justly consider the fibers of the optic nerve as such) through the optic nerves, and then farther to the corpora geniculata, and still farther by the visual radiations to the cortex of the occipital lobe, where it becomes fixed in the memory. Now, after this sense-perception has been transmitted farther from the occipital lobe to the vari-

²⁹ Campbell, *Histological Studies on Localizations of Cerebral Function*. Cambridge, 1905.

ous brain-centers, where the rose becomes appreciated in regard to its general appearance, its color, its perfume, etc., man, who loves nature and its wonders, does not stop at that. A great number of pictures of roses which he has seen before come up in his mind, and comparisons are made in regard to their size, their color, their perfume, etc.; in other words, the man *thinks*.

If instead of a rose the frog should happen to see a fly, he would not pass by it without having some feeling. He would open his mouth, catch the fly, and swallow it. This is, however, with him not a process of thinking; he is not able to think, because he has no brain-cortex. His action takes place without the aid of the cortex; it is, therefore, subcortical; it is simply a reflex process, the same as in man; the animal processes are independent of thinking. When, however, it occurs that at a dinner, while a toast was being delivered, one of the guests has a roasted goose set before him, he would not immediately attempt to eat it, because as a thinking, cultured man he would be influenced by the laws of convention. The thought which was dictated to him by observation of good manners would induce him to refrain from eating until the speech was completed. Only the idiot, or the hopelessly insane, upon whom no interceptions act, whose actions are done without thinking, would be guilty of such conduct; we, who live in society and are thinking men, will submit to the generally established regulations of good custom, because a little thought in this matter would make us realize the folly of not taking them into consideration.

CHAPTER XXXI.

RATIONAL THINKING.

IN general our thinking is stimulated by various impressions, which act upon our sense-organs at the time, or have acted on them some time before, and have reached our consciousness. As long as we are awake such impressions rush upon our sense-organs from all sides, but when due to external conditions, such as, for instance, in a dark and perfectly noise-proof room, impressions are not perceived any more, and no sensory stimuli otherwise act upon us, the wakeful condition passes into one of sleep. The conscious thinking then ceases, but not the subconscious one, because dreams are also conditions similar to those of thinking; only the logical consecutiveness of thoughts, their mutual connection, is, as a rule, absent. This kind of thinking may also be caused by sensory impressions, but these do not act, however, as a rule, upon our organs of sight and hearing, from outside, as they cannot be perceived during a deep sleep, but are caused by various conditions in the internal organs, as, for instance, by an overloaded stomach or by sexual glands overfilled with secretion due to sexual abstinence. But, also while awake, such appearance of various thoughts, such dreaming may take place; in those well mentally this is rarely the case, except probably before falling asleep during the day or night. Much more is this disconnected, confused thinking the case in individuals deprived of their minds. This wandering and confused thinking may be recognized, not only by their acts, but also by the speech and writing of the victims. Our speech is nothing else but our thoughts expressed by sounds, and our writing, in like manner, expressed by written characters. Every man's manner of thinking may be recognized from his way of speaking and his writing, unless we accept the limitation, in regard to speaking, given by the clever but very vicious Talley-

rand, that the purpose of speech is to conceal the thoughts. A normal, natural man, particularly when he is not under the social restraint of culture, is very plain spoken, and the same is true of children and fools, but when the cultured man glosses over his thoughts with his speech ever so much, one who understands human nature can very well discern his innermost thoughts from the way he speaks. Man expresses also his manner of thinking in his writing, and this has even led to the development of a new science of graphology, which attempts to recognize a man's character from his penmanship. The various kinds of mental deviations also lend something characteristic to the manner of writing, so that certain mental diseases, such as paralysis, may be recognized by the manner of writing, or, in case of painters, by their drawings and pictures. In the manner of drawing and in the presentation of a picture is disclosed the way of thinking of the individual painters. Just as every man thinks differently, depending on the pictures presented to him by the perceptions of his sense organs, so would the paintings of the same subject, by different artists, appear entirely different, depending on the conception of the artist and his peculiar gifts of intelligence and imagination. Mentally diseased artists betray plainly the signs of their insanity by the grotesqueness of their drawings and paintings, and the same is true in regard to writers. This, however, has not prevented such productions from becoming famous, for instance, Greco or "Zarathustra" of Nietzsche, who, notwithstanding the signs of insanity, gained great distinction in some places. In making a drawing or a picture, the artist must reproduce all his thoughts, which means himself, in a like manner to a man when he speaks or writes, but he can present the picture of an object only as he saw and understood it, and herein is manifested the peculiarities of his way of thinking. The artist must present it in dimensions and colors, and with the details, which correspond to the actual object. In case he is not able to observe the proportions of things, as happens in so many nervous people, in

neurasthenics and hysteria, it would be manifested in his manner of drawing and painting by exaggeration. Behind the exaggerations, misrepresentations of nature in art by secessionists, impressionists, futurists, and cubists, the overproductions on the stage and in many "cabarettes" is hidden the condition of degeneration. This overdoing seems to be also getting a foothold in fashions and in the art of dancing. All these exaggerations and extravagances, true crimes against good taste, often betray grave injuries of the nervous system and of the mental state, except when it is used as a business trick, to get as much money out of it as possible; and, in such a case, it is simply to be condemned.

These confusions in taste are in the same relation to the more gentle and refined taste of our progenitors (for example in the eighteenth century), as is the sliding dance of the present day to the graceful minuet of those days. The good taste of a man also depends upon his intelligence.

Good taste is nothing more nor less than a correct estimation of all proportions. In dressing, for instance, it manifests itself by simplicity, refinement and avoidance of all exaggeration. The latter we find only in people with little intelligence, as, for instance, in those who, through fortune, became suddenly rich, in "nouveau riches," who may be easily recognized by their lack of taste in dressing; and still less taste in the planning and arrangement of their houses and villas. Those of a low grade of intelligence dress in very glaring colors; like idiots, they are attracted by the dazzling red colors. The best taste in dress and in manners is shown by people of high intelligence, and no one disputes the fact that the English and the Americans are the best-dressed people; in their mode of thinking, imagination and good judgment are paired together to complete a successful combination. If we designate *good taste* as the putting the right scale on all dimensions, as proper selection of the right colors and shadings, then lack of taste manifests itself, on the other hand, by wrong scaling of space and size, proportions, and

faulty and awkward selection of colors. This is all caused by lack or wrong development of the senses, by want of exercising the senses, which we consider as necessary for the development of the intelligence. A good taste, indeed, presupposes an intelligence and the right use of our senses. We are, therefore, able to recognize an intelligent man by his external appearance.

The sound, rational, human mind, and real art, look only for what is natural in all things; a green sky and blue grass could never be perceived by the former, and never presented by the latter. Any object, for example, a scene, a landscape, may be presented by a painter according to his own judgment, either as absolute, realistic, therefore perfectly corresponding to the true nature of the object, or it may be presented idealistically, perceived with a rosy inspiration, and I express I believe the spirit of the majority, when I assume this to be the more sympathetic way, but the real limitations, the true colors, the true measurements must be kept. On this last point, *observing the right scale*, I would like to lay particular stress. The normal, soberly and rationally thinking man would put the right scale on everything; as soon, however, as there is a deviation from the normal way of thinking this becomes lost in regard to body as well as to mind. Lombroso mentions a case of a paralytic artist who, in his drawings, presented everything in paralytic artist who, in his drawings, presented everything on while the legs were still on earth. These extraordinarily large measurements for the body are also reflected in the mental process of the paralytic. First of all, they have a most exaggerated opinion of their own immense importance. They own countless millions; are able to pay all the debts of the world; consider themselves as the most handsome men, endowed with greatest wisdom.

We thus clearly see how an exaggerated idea in the measurements of the body leads to the same in regard to the mind. Similar conditions we see in one of the most frequent mental diseases, in dementia præcox. When we look at the drawings

made by such patients, as, for instance, in a case described by Kraepelin in his "Handbook of Psychiatry,"¹ we observe that all dimensions are distorted, everything crooked and uneven; and the same is reflected in their way of thinking. *Anyone who is not able to measure things with his eyes, is not able to do it with his mind.* The plainest and most instructive example in this respect is the high-grade idiot. He lacks any perception of physical measurement, such as size and space; he is not able to think about anything or to form any idea about anything at all. With this, place for contrast the intelligent man who possesses the right eye measurement for everything. To anyone who stands at the rudder of a ship, without having a fine, fixed eye measurement, and without being able to estimate the distances of various objects and their relation to one another in the space, it may easily happen that his ship would be wrecked in a narrow passageway. If, however, one is a capable pilot, who is able to estimate to a very fine degree the proper space relations and the right proportion of the objects, he would always be revealed as an intelligent man. What is true of speech and writing is also true of thinking, and the intelligence of a man may be concluded from the way he acts. An intelligent man would also be easily recognized from the way he manages his own lifeboat. He leads it safely away from all the cliffs, whereas the fool would pilot his boat to destruction upon the rocks. *Every man's future is determined by his acts, and everyone of us is the pilot of his own fate. He would succeed in life best who is consistent in all his acts, and keeps the proper measure in everything.*

As this latter is indispensable for correct and rational thinking, we would do well to educate a man with this end in view. Therefore we should instruct the child to learn to estimate measurements by sight and feeling.

As we have said before, thinking means linking together of thoughts, but every thought corresponds to a picture

¹ Kraepelin, Psychiatrie, II Teil, S. 733. Leipzig, 1913.

of an object which we have perceived. If we want to think correctly we must have a proper picture of every object; therefore, also a proper perception; and that means to say we must see distinctly and learn to fix all details in their true size and proportions. Otherwise, we get a false picture, false perceptions and thoughts, and, in consequence of it, also an incorrect, false train of thought. It is well understood that a correct view and correct measurement are only possible when the organs of sight and the respective sense-centers are in an intact condition. As soon as the latter are undeveloped, as in high-grade idiots, or is pathologically changed, or the blood-supply is rendered difficult, sense impressions cannot at all, or only insufficiently, be received; and, on account of false perceptions and thoughts, a wrong thinking takes place. A similar condition is found in intoxication, when wrong ideas may take place in regard to size and location of various objects, so that straight objects, like lamp-posts, may be seen as crooked. In hysteria the organs of sense are often hypersensitive, and, therefore, we find here also exaggeration of perceptions. Under the influence of passion something similar may occur in otherwise normal individuals.

From all this it follows that a systematic education and being accustomed to sizing things up in the right way, and seeing things in the right light, from childhood up, is of greatest advantage for intelligence, and for correct, rational thinking. It is, therefore, appropriate, by means of special exercises, for the respective senses to develop the sight, feeling, and also the hearing in children between 5 to 7 years of age. Of the importance of such sensory exercises we will speak later in detail, and will also mention there the Montessori games. In the latter the children get a game in which they have to measure the size of various cubes, so that the largest would come at the bottom to serve as a base, and the following become smaller and smaller, until a tower is formed. Properly, our mental work should also be builded up in such a way, so that the most solid conception,

the picture perfectly corresponding with the truth, should form the safe base, which would make a perfectly safe foundation. Only such pictures and thoughts should be used as building stones which correspond to the truth in all details. In other words, exact knowledge should form the foundation, and in the selection of the building stones we should be guided by reason, which accepts only that which, in all its dimensions, fits into the corresponding joints and harmonizes with the other building material. Only when it becomes impossible to make a farther advance, with the aid of our knowledge and judgment, and the building is already half finished, we may call to the rescue our imagination. We will then select first what seems to us *probable*, and should that not be sufficient, we will use such arguments as seem to us *possible*, and fit into our frame. In the trend of our thought we must proceed to our conclusions, from the known, perfectly certain, to the unknown. Only finally we may take our refuge in the hypothesis, first, however, to what seems to us credible, to the *experiment*, and only when this is impossible to the hypothesis.

In solving a problem we can also proceed to follow the same picture as used above as we do in tearing down a building. We take the building stones apart, examine them closely, and compare them with one another in regard to their resemblance. Here also we have to deal with size proportions, and we learn from that how important for logical thinking may be the knowledge of mathematics and geometry; of course, not the dry knowledge and memorizing of numbers, but mathematical combination ability. Here it is also necessary to have, first of all, keen sight, because in a given problem, something unknown to us, in something new, the object is to discover with a keen eye one or two essential characteristics, so that we can search in our store of memory pictures whether we have already in our possession something similar. We thus must attempt to discover some resemblance between them, and, on the other hand, to find out the differential characteristic, and to examine where the differ-

ences actually lie, and by what they are caused. In this way we may be most certain to come near the true solution of the problem.

Now to recall to our memory again a picture already seen we must possess a good memory; this is, therefore, of great importance for rational thinking. Again, a great store of memorized pictures can be accumulated only through extensive knowledge, gained by much reading and studying. The greater the store of pictures from various domains we have at our command, the more would our thinking be facilitated. A thorough school education, and, first of all, much reading can supply us with an extensive knowledge. Extensive knowledge, many-sided, is an essential preliminary requirement for rational thinking; with this, however, must be combined the ability for practical application of that knowledge. Intelligence is not promoted to any extent by a one-sided theoretical knowledge, because in that instance a miscellaneous collection of pictures, perceptions therefore from various domains, which support the thinking, does not exist. It is, therefore, not to be wondered at that we see so often, with one-sidedness, stupidity, clumsiness of so many scholars, and lack of "common sense" go hand-in-hand. Aside from such one-sidedness we find very frequently criticism above the normal, an exceedingly great skepticism and lack of imagination. In the flight after higher goals, in the search after something entirely new, not discovered yet, there is also required, besides a sound reasoning, a very large faculty of imagination, which is absolutely necessary.

Without the latter, and the combining ability which is due to it, there can hardly be a possibility of any great *original idea*, of any original discovery or invention, of any kind of artistic creation. With the gift of criticism alone it is possible, by very great diligence, to produce, to supply plenty of strictly exact scientific contributions; but only rarely can be found in such productions any original ideas, anything new. Very often such contributions are sufficient for the purpose for which they are written; it is even possible to get through them a professorship or

Geheimrat title, and this is sometimes easier obtained than by bringing forward some new, great ideas, which may serve as an impulse for important discoveries, but cannot be proven by exact experiments at the time. Our era does not honor readily great ideas and thoughts; it also does not like the geniuses; middlings often get much farther. O golden mediocrity

CHAPTER XXXII.

EXTERNAL AND INTERNAL SIGNS OF HIGH AND LOW INTELLIGENCE.

AN intelligent man may, as a rule, be distinguished from an idiot by his external appearance. It is only necessary to look over a collection of photographs of great thinkers, scientists or artists, and compare them with the photographs of idiots. In the former the frequency of the high forehead will strike us first of all. Sometimes the size is even above normal, as, for instance, in Newton, Walter Scott, and others. We also notice a well-formed nose, with its often beautiful curve. Contrast with this, as a rule, the ugly, often grotesque faces of idiots with their low foreheads and outstanding ears. This great difference may possibly be attributed to the condition of the ductless glands, upon which depend not only the growth, nutrition and metabolism, but also the formation of the brain, and structure of the skeleton, including the bones of the skull. These glands are: the thyroid, the sexual glands, the hypophysis. How much the form of the face is influenced by disease of the latter is already apparent from the prominent lower jaw and the big, broad nose in acromegalics, but when thyroid is administered it can often be observed that the nose becomes narrower and its contour becomes finer. On account of the fact that these glands regulate the calcium and phosphorus metabolism, the teeth cannot develop properly when these glands are diseased, and a faulty, step-like form of the upper jaw is the result. And because the teeth and jaws constitute the main skeleton of the face, the latter, in the idiot, assumes a peculiar expression, which is made more pronounced by the broad, often open mouth. There are found sometimes idiots who have a normal, sometimes even a handsome face, as I have seen in some girls—idiots in Dalldorf, but these are only rare exceptions.

In view of the fact that some relation exists between the construction of the skeleton and the expression of the face, which denotes the qualities of intelligence and the spiritual condition, and, as we will see later, the inclinations to crime (idiots show indeed very often similar degenerative changes in the face), there may possibly be created a certain base for a scientific physiognomy. Possibly such a science may develop in the future, on a more scientific foundation than at present, because we have now something tangible in the established fact that the thyroid and sexual glands have undoubtedly an influence upon the calcium and phosphorus metabolism, and consequently also upon the external formation of the face. At the time of Lavater these relations were not even suspected, and, therefore, his observations could not claim to be scientific. Moreover, very curious mistakes have been made sometimes by Lavater. Once there were sent to him pictures of two individuals for an expert opinion in regard to their character, to be judged by the expression of their faces. The laconic answer was, "Two rascals!" And who were these rascals? The priest and the judge of a Swiss community, well known for their honesty.

An idiot may often be recognized, not only by his external appearance, but by his walk. In all his motions he is awkward and clumsy, in direct contrast to the dextrous appearance and cleverness of an intelligent man. This is, in the feeble-minded and idiots, undoubtedly due to a certain extent to an imperfect development of the sense organs, in consequence of which there is an imperfect perceptive faculty for correct size and proportions of things. Whereas, in highly intelligent men, and still more so in geniuses, there is present a hypersensitiveness reacting the slightest on impulses. We see, as a rule, in the feeble-minded and in individuals with very little intelligence a hyposensitiveness of the sensory organs, so that their attention is stirred up only by strong impulses. This is the reason why the latter have such enthusiasm for dazzling red colors, for noisy music, and for strong, penetrating perfumes. This is often a distinguishing trait also

of certain classes of people in a state of low intelligence, for example the negroes, but it may also be found sometimes among individuals of so-called good society. A fine taste is just as much a sure sign of a high intelligence as bad taste, and tactlessness is a sign of low intelligence, even if found in men of learning, as is, unfortunately, by no means a rare occurrence. I am, moreover, not inclined to make the assertion that great learning and high intelligence go hand-in-hand; there are many one-sided learned men who are very efficient in their limited domain, but are entirely helpless in all worldly things, undoubtedly because of the neglect in the course of their education to develop *all* their organs of sense. A man whose outlook is narrow sees only what is very near; he cannot venture too far, and this timidity before the unknown makes him too cautious. Because his eyelids, as it were, obstruct his sight and his horizon is a very limited one, he lacks a great store of experience in forming his opinion, and he will antagonize *a priori* all the new things coming up. For fear he may do something wrong he becomes a skeptic, a negativist, and all new ideas and new discoveries must reckon with such born antagonists. Often new ideas and discoveries may be thus kept dormant for many decades, to the loss of all mankind, until finally the sound, broad-sighted, human mind can at last get the upper hand. For everything else we may look, in some of these learned gentlemen, except for a natural, healthy, human mind,—for common sense! They have spent too much of their time sitting in their study, and have not seen the wide world!

The feeble-minded and the narrow-minded men are recognized by their narrow horizon. Their organ of sight is often undeveloped; it may often be of congenital origin, and in course of their education was neglected, and did not receive better development. Just recently I have been able to observe a gentleman, who was an offspring of inbreeding between relatives; he was afflicted from birth with a weakness of sight, so that he was able to see only objects which were near, and his wife (who was under my treatment for gall-stones) had to lead him. His gen-

eral intelligence was not bad; he was also well read, but all his conclusive judgments were just as narrow-minded as his sight. In a mental respect he had just as small a horizon. Of course, even the blind may be intelligent, and even if also a deaf-mute, as we see, for instance, in the case of Laura Bridgeman and Helen Keller; but these two have a surprisingly fine feeling, and besides they are the offspring of Americans. At least one of the sense-organs is particularly developed in the blind, the sense of touch. The blind mathematician Sanderson, as mentioned by Abercrombie, was able to distinguish among a number of Roman coins, the good from the bad. That a mentally narrow man sees only the nearest in his horizon is perfectly natural. He does not keep in view the essentials, but only the external appearance of things, the material part; he differs entirely from the intelligent man, who looks more for what is hidden away, and tries to find in everything more the ideal purpose and the goal. The materialistic thinking man of low intelligence is only interested in the pleasure which he is to get out of a thing; everything else, more distant reflections, leave him cold. Essential points in any difficult problem can only be caught by the keen eye of a highly intelligent man; he does not overlook in the least; he does not neglect even the most insignificant details, and he is, therefore, able to make epoch-making discoveries and inventions, just because he sees things which have remained unnoticed by hundreds before him. A genius is sometimes able to think for hours over apparently insignificant occurrences, because their true significance strikes his keen eye like lightning. In this way came the discovery of very important physical laws, which made the names of their discoverers immortal—Newton by the sight of an apple, Galilei by the sight of a lamp swinging in the church. It is just this ability of continuous meditation, persistent concentration of attention on one point which marks a genius, and also the iron diligence connected with it in entire contrast to the idiot and feeble-minded, as well as to mentally narrow men, who, as a rule, lack this quality, being more inclined to laziness. Anything

that does not bring him profit immediately, a problem which cannot be solved at once, leaves the narrow-minded disinterested.

The genius, on the other hand, does not rest, until he, like Archimedes, can exclaim "Eureka." He has the keen glance of an eagle, which enables him to compare some insignificant characteristic of one object with that of another far distant object, and to discover some surprising relation between them, whereby the solution of some difficult problem may be accomplished. Of course, in this case a large faculty of imagination is required; but the genius is not deficient in that. It is in him a necessary requisite. Imagination alone, however, does not make a genius; insane people have frequently a very vivid imagination; children have also; but both lack judgment. The combination of these two is what makes a genius. Even narrow-minded people are not deficient in judgment by itself. We find it often in one-sided scholars; but these, in their publications, sailing in the same waters as numberless others, are treating always of the same subject, without ever being able to produce any new, original idea. They do not dare to get out of their narrow circle of ideas; in all their acts they are timid and slow, and we can very well repeat to them the words of the poet, "Whoever does not dare to climb a shaky ladder should continue to crawl courageously on the ground." But that genius may not fall from the shaking ladder in the scientific domain he must possess enough judgment to keep it well supported. It would be too small to judge productions of such men of genius by some deficiencies in the details which they may contain, to pick out only trifling things. A critic who has not the understanding to find the essentials in a production, but pays attention to only side issues and details, is very liable to betray the narrowness of his own horizon.

We have already mentioned that mentally narrow men, due to their small range of vision, see only the things nearby. This is also true in regard to time conditions; only the present is of value to them, not the future. They do not look out for the future, and lack any kind of foresight. This we observe in its

typical form in children; also in mentally narrow men, as well as in people of low intelligence.

It is said that the natives of New Guinea sell their hammocks in the morning, because they do not need them and buy them back in the evening at an advanced price. In all undertakings, let them be ever so important, the lazy Andalusian says, "Manana" (tomorrow), and puts it off at "Calendas græcas!" This want of foresight in mentally narrow people is shown particularly in regard to health matters. When they get sick they call for medical help only when they are driven to it by great pains, and as soon as these cease they discontinue the treatment, irrespective of whether they are cured or not. If they have acquired syphilis they take half-way measures until the visible signs have disappeared; they would not think of taking a number of rigid treatments; they often know the consequence of their negligence, but as these appear only years later, they continue to live on unconcerned, until the punishment comes in the form of a painful tabes or in a breakdown in body and mind, in the form of fearful paralysis. In my practice in Carlsbad I see daily patients with liver troubles, who did not come for treatment when the liver was hypertrophied but still soft, but waited until the liver became entirely hard, when the parenchyma was destroyed and transformed into connective tissue, and then they would like to get cured very quickly—in three weeks. Most of such fatal sins of negligence we see in mental diseases; when the development begins and there is still time to improve the condition, and it would be possible to prevent, probably, a mental disease, a psychiatrist is seldom consulted, but he is called upon only when the disease has broken out and there can rarely be any help. No other domain of prophylaxis has been more sinned against than just here, and, therefore, it is not to be wondered at that the therapy of the psychiatrist is so powerless.

The majority of the public in general—one is almost tempted to consider them mentally deficient in this respect—are exceedingly foolish in many questions of prevention of disease, but,

first of all, in the assumption that when one is well, he can do without any medical supervision at all. In this respect the Chinese could serve as a good example, as they mostly have themselves examined when they are well. A machine may run ever so well, but a conscientious mechanic will, from time to time, look after it, and examine closely the individual parts to see whether everything is in order and well oiled, but in the most precious machine of all, a defect is allowed to go on further and further, and help is looked for only when the movement is half destroyed and a restoration of the former working capacity is no longer possible. Many a man seems in splendid health, and yet in his urine may, under the microscope, constantly be found red and white blood-corpuscles, until some day half of the kidney is found destroyed by tuberculosis, and eventually a profuse hemorrhage reveals the true nature of the condition; sometimes, unfortunately, only when it is too late. Or the urine may contain sugar (while the individual may be apparently in splendid health) in no small quantity, and the disease is only discovered accidentally after a number of years, when it is far advanced and poisonous substances like acetone and acetonacetic acid are formed. I cannot understand why everybody, at least once in his life, does not have his urine examined. A time may probably come when a precautionous government may make it obligatory for every citizen in advanced age, to undergo a thorough medical examination, say once a year, and not only physically, but also mentally. How much suffering and misery could thus be avoided! Physicians as teachers and educators of humanity should, by virtue of their profession, inculcate these principles in the children at school. The more intelligent a people become, the more will the principles of hygiene be observed, particularly that of cleanliness. What is the benefit to humanity when ardent scientists hunt after the bacteria, and at the same time is permitted the existence of badly ventilated theaters, cafés, moving-picture theaters, where, often under the influence of great heat, these organisms are cultivated? The negligence of the masses comes not only from

their lower intelligence, but also from another cause, which is so often found among mentally narrow people, from their weak will power. In another part of this book we have designated will power as a continuous concentration of the whole attention and of all the thoughts on one point which it is desired to attain. This faculty we almost never find in mentally narrow people! When, moreover, a person does not possess any foresight and insight, nor any will power, it will manifest itself in action, and as such a person lacks these main barriers against criminal acts, he may easily be led to commit such. And, in fact, those who constitute the main source of criminals are the idiots and feeble-minded. They lack insight into their own actions, the foresight to warn them against the bad consequences, and the will power to control their passions. Whether they are already constitutionally predisposed to crime can frequently be seen from their external appearance. The signs of degeneration, which they, according to Lombroso, have in common with idiots, and from which he traces the "reo nato" of born criminals, constitute, according to what was said at the beginning of this chapter, only these external characteristics which indicate to us the changes in those organs which influence immensely the structure of the skeleton as well as the condition of the brain and the intelligence, namely, the changes in the thyroid and sexual glands. In criminals we find very often changes in these glands, as I called attention to in one of my lectures,¹ and, therefore, I am of the opinion that we probably should be able sometimes to prevent crimes by treating degenerative changes in the thyroid and sexual glands. Aside from medical treatment there should go hand-in-hand an elevation of the intelligence and strengthening of the power of judgment by an appropriate school education. Elevation of the intelligence of a population is indeed the most effective preventive of crime.

¹ Meeting of the Medico-Legal Society, Philadelphia, April 19, 1907. Reported in the Monthly Cyclopædia of Practical Medicine, Philadelphia, 1907.

The intelligence of a person manifests itself, as we have said before, not only in the actions, but also in the speech and writing. We are often able to judge a man after a short conversation with him, and about the writing it is justly said, "le style c'est l'homme."¹ Even from the external appearance of the writing, the written characters, we are often able, as before mentioned, to recognize the mode of thinking and mental characteristics of a man; also the degree of education from the spelling. The composition of a pupil betrays his personality. The high intelligence of a man is manifested by the fact that he is always able to find the right expression, that he never lacks words to express his thoughts. A man of high intelligence often has the ability to express himself briefly, and at the same time say a great deal; and, first of all, to emphasize the essential things, and express himself in correct form in all respects. The man who lacks intelligence pleases himself by the rendering of details with greatest circumlocution, and he cannot find the proper expressions; sometimes he applies selected phrases in places where they have no sense at all, and the real meaning of which is not perceived. What great nonsense may sometimes result from it, particularly when incorrect expressions may cause double meanings, is shown by a letter which was written by an ambitious butcher's apprentice to his parents in Linz on the 20th of March, 1913. The letter is as follows:—

In one month it will six weeks, since I have raised myself to an efficient butcher's boy. My master shows me everything with the greatest frivolity. He has already permitted me, to take part in stabbing, three times. If I conduct myself properly, I will be a party to the killing.

Namely, of two oxen, of which one is a cow, with which I have the honor of being,

Your thankful son.

¹ The style is the man.

CHAPTER XXXIII.

THE IMPORTANCE OF EXERCISING THE SENSES.

ANIMALS on the lowest plane of intelligence have sense-organs which are developed very little, but the higher the animal stands in the scale in regard to its development and intelligence, the more perfect these organs become. At the top of the scale is man. Whereas in animals, as a rule, only one of the sense-organs, depending on the species to which they belong, is particularly developed, as, for instance, the sense of smell in the dog, the eye in the birds of prey, the hearing in some rodents, there is no creature in the whole animal kingdom in which all the various sense organs are developed to such an extent as they are in man. I may call attention in particular to the wonderfully artistic construction of the human eye. In regard to acuteness of vision, birds, it is true, rise above him, but, on the other hand, the human eye possesses a number of other perfections which are lacking in animals. This corresponds with the structure of the human brain, of which the inner eye is only a projection. If seeing at a distance was an expression of perfection, then far-sightedness would also have to be considered as such, but this is a faulty condition.

When we say that lower animals manifest a lower development of the sense-organs, we can just as well turn the spear the other way and say that an animal must have a low grade of intelligence when it has badly developed sense-organs; and, on the other hand, if an animal shows well-developed sense-organs, it also must be an intelligent animal. That here a connection exists between cause and effect, and that consequently the lower or higher intelligence of an animal depends on the condition of its sense-organs, we can prove by examples which are found in man.

We see that, as a rule, the degree of idiocy varies inversely to the development of the organs of sense, and that among the

various sense-organs it is the eye which plays a dominating rôle in man is manifested by the fact that in idiots it is just this organ which is chiefly retarded in its development. The fineness of a sense-organ can be judged best by the condition of its sensibility. In idiots of the worst type the retina is distinguished by such insensibility that they can look straight into the sun or into a brilliant source of light without a twinkle. This insusceptibility of the sensory organs and their deficient development we find in all idiots, less pronounced the more they are capable of education, and much more pronounced the greater the degree of idiocy.

As a contrast to the insusceptibility of the sense-organs in idiots I may mention the very frequent oversensitiveness of these organs in men of genius. The latter feel disturbed often by the slightest noise. The great English historian Carlyle had his bedroom in that part of the house which was farthest from any sound. Kant, Goethe, and Schopenhauer were also exceedingly sensitive to the slightest noise. Kant had to change his residence once because the roosters disturbed him at night, and another time because the singing of the prisoners in the prison nearby annoyed him in his work. If it is true, as assumed by Manz, that scintillating scotoma may originate from the retina—and a number of distinguished authors incline to this view—it is significant that it most frequently occurs in mental workers, particularly in the form of abortive migraine, without headache, as a *fortification-wall-like lightning ray* (teichopsie), and usually may be produced most easily by dazzling light. Some geniuses have had an oversensitiveness of smell, as, for instance, Baudelaire, Goethe, and Newton; Napoleon suffered from sight hallucinations. As a best example I may mention Kant. He had an exceedingly fine taste, and a very acute hearing and sight, and was able to read without glasses up to the last weeks of his life.¹ The close relation between intelligence and acuteness of senses is,

¹ Nach Jachmann, Das Leben Immanuel Kants in Birefen, Königsberg bei Nicolovius, 1809.

moreover, expressed by the German word "Scharfsinnig," which is applied only to intelligent people.

The great susceptibility of the sense-organs, their great reactivity upon smallest impressions, I have already considered as a characteristic sign of neurasthenia and hysteria. Indeed, there has hardly ever existed a genius who was not nervous.

The great men, discoverers, inventors, have often been distinguished by the fact that the smallest stimulation of the senses has been perceived by them, and stirred their attention; and it was often due to this that they were able to pursue fine observations and make discoveries. Thousands of people could have seen an apple fall or a lamp swing without these things having created in them any further sequence of ideas, and still these were the things which led Newton and Galilei to the discoveries which made them immortal.

The old, great masters in medicine were able to make very often a right diagnosis on the first glance, or by the sense of smell. Of course, their organs of sense were sharpened by continuous exercise, and they had spent all their time observing patients. Because the accessory means of scientific medicine had not as yet been developed they had to use their senses, and this is how it came about that to make a diagnosis for diabetes they had to touch the urine with their tongue.

Now, if the sense-organs are undeveloped, the intelligence also remains undeveloped; and in case the former are in perfect condition, the latter is usually of a high grade. Hence, the conclusion may be drawn that the more the sense-organs are developed, the higher will the intelligence advance. If, therefore, we want to make a person intelligent, we must begin in his early childhood, and teach him to see, hear, smell, feel rightly; afterward he must continuously exercise these senses. This is quite natural, because only by his sense-organs is a man able to receive impressions, and thus get an idea about the various things in the world. Such exercises also directly benefit certain brain-centers. The more such impressions a child will

take in, the richer will be the store of experiences which it will possess. The better his sense-organs are developed, the finer, the sharper they are, the richer will be the store of correct, sharply defined pictures which can be taken in and stored up in memory. The first impressions which a man receives are often the most decisive, and it is, therefore, most important that they should be correct from the start; consequently a child should be able to observe, and must be taught to do it. It is found, moreover, that children of congenital intelligence are very inquisitive; they want to see and touch everything; this manifests a longing for knowledge, which can be led into the right channels by sensible advice. Here a wise father, or teacher—the best name for him would be advisor—by exercising the senses in the right direction has a deciding influence upon the future career of a child. It would be very appropriate to exercise the senses of a child, and particularly when the children are only slightly active mentally, by the methods of instruction which were introduced by Maria Montessori¹ in Rome. I had an opportunity to observe her method in the Casa dei Bambini (Children's Home) of the Humanitarian Society in Milan. The teacher makes the room perfectly dark, and in a very low, whispering voice calls one of the children. This naturally induces the children to keep perfectly quiet, and pay attention so as to hear the sound. They thus practise listening. Soon after the teacher makes a small clock tick in one of the corners of the room, and then asks the children from where the sound comes. If she then hears a wrong answer, she inquires which child did not hear the clock in the right place, and examines more closely the hearing of the child. It is known that in case of weakness of the hearing on one side the source of sounds and noises cannot be located, and is transferred to the side of that ear which hears the best. It is indeed of greatest importance to find out just such deficiencies in the sense-organs in children very early, otherwise it may happen that the unsatisfactory doings of a child would be

¹ Dr. Maria Montessori, *Selbsttätige Erziehung*. Stuttgart, 1913.

attributed to the lack of will and diligence, and not to his physical deficiencies.

That human intelligence can only be developed by exercising the organs of sense we can learn from the example presented by the child. The child's thinking, as already said, is based only upon the sensory impressions which it has received. From that it forms its first ideas, which are, therefore, all concrete. From these concrete ideas it then forms its abstract ones. Abstract thinking, the higher kind of thinking, is entirely impossible without the concrete one. A man who does not reflect over the sensory impressions received, and who, therefore, cannot think concretely, is also not able to do higher abstract thinking, the ideal thinking, properly. We see this, for example, in idiots, whose sense-organs, as a rule, are not developed, and this corresponds in exact ratio with the grade of their disease.

The exercises for sharpening the sight in children consist in showing them colored wooden blocks of various lengths, which they have to arrange in a certain way; that is, to begin with the shortest. A still finer exercise is the assorting of spools of silk of various colors and shadings, whereby those belonging to the same color are to be put together. An advanced lesson consists in making a scale of various shadings of the same color from lighter to darker. The touch and sight of the children may be exercised by putting wooden squares of different sizes together, so that the largest would be at the bottom, the next smaller to follow until a pyramid or a tower is formed. Another exercise is to pick out the squares of equal size. These exercises also serve to strengthen the faculty of seeing and the ability to differentiate. The sense of touch may also be very much developed by an attempt to put plugs of various sizes in corresponding holes, into which they must fit perfectly, or by putting buttons of various sizes into the proper buttonholes. Such training also develops the manual dexterity of the children, and this is of so much more importance because they learn something which they

otherwise would never learn in school; namely to become practical.

Sight and touch are also exercised by the introduction of another practical feature. Before the beginning of the daily instructions each child is alternately obliged to examine the hands, ears and teeth of their little classmates. When some uncleanliness is discovered, the respective child is led by his comrade to the wash basin to be washed. This sharpens the sense of cleanliness in the child and makes him accustomed to the importance of practical hygiene, and educates him to a beneficial altruism.

I think that these exercises could be made still more perfect by the additional use of games for testing the intelligence, as introduced by Mikulski. These consist in half figures of various animals, as, for instance, of dogs, lions, cats. If one puts a dog's body on a lion's head, with a mane on it, an intelligent child would become startled, and would soon pick out the corresponding part. The children who are lacking in intelligence could be instructed, and advised in selecting the proper parts. Of course, it is necessary that the children should have already seen pictures of various animals. In this way, and by the methods described before, not only the use of the organs of sense are exercised and size perception is strengthened, but by comparing and finding out the differences, thinking is also stimulated and the store of experience enriched. As a very useful exercise I would recommend that the child be shown a number of objects of the same kind, which differ from one another in some details, and let it find the difference for itself. In this way the acuteness of the senses are promoted very much, particularly those of sight and touch.

We are, of course, dealing here, in the first place, with practical, tangible, concrete things. If, however, the children have learned the correct estimation of these, the actual thinking in a theoretical way could be easily added. This method is evidently just the opposite to the one which has always been in vogue in

our schools. The object of the latter is to instruct the children in the theoretical part, and only afterward, when they become discouraged and disgusted, to give them the practical part. Whereas, by theoretical instruction in school, the senses, with the exception of the hearing and to a certain degree also the sight, are neglected, we could, by the exercises mentioned before, unfold them, and then have manual training follow, and thus bring up a generation of both practically and theoretically correct thinking people.

Success will be still greater if the children would later on join the organizations of the pathfinders, and by long excursions, under proper supervision, into the haunts of mother nature, make the senses more acute.

CHAPTER XXXIV.

THE ADVANTAGE OF EXTENSIVE TRAVELLING AS PRACTICAL EXERCISE FOR THE SENSES.

IT was a remarkable characteristic of the great men of past centuries that they liked to go on long journeys. They used to spend years in this manner, and that was at a time when there were no railroads and the slow traveling in stage coaches was not only very troublesome, but also not without danger. At the time of Erasmus of Rotterdam, and also of Leibnitz, a man had to make his will before going on a journey. Notwithstanding this we see how the former, that distinguished scholar, travelled extensively and led a roaming, wandering life. This was also the case with the great philosopher Descartes, who refused to live quietly at his leisure with his wealthy family, but preferred military service in the Netherlands. Then, wandering aimlessly through half of Europe, he came by chance through the north to Stockholm. Locke, Leibnitz, Karl von Linnee, Swedenborgh, all of these men made long journeys and remained for long periods in foreign countries, as did also the great poets and writers of those times. The adventurous life of Cervantes is known; he was for long a soldier, fighting for the Spaniards in foreign countries, and for many years was a prisoner of war of the Bey of Algeria. Petrarca, Giordano Bruno, each travelled extensively. At a time when it was so dangerous the distinguished Flemish physician, Van Helmont (who so successfully fought against the wrong teachings of the Galenic school, particularly venesection, which was so highly recommended by it), journeyed through Europe as far as Tartary. Willem Rommel reports in his book on Van Helmont that the latter travelled through Austria, Bavaria, then came to Russia, as far as the border of Tartary, and went later to Alsace, France, Italy, Spain. Everywhere he observed the practice of medicine, and

in this way accumulated useful knowledge. In the same way the great thinkers of later centuries, Rousseau, Voltaire, Goethe, made long journeys. Goethe stayed long in Italy, and travelled much in general, and that at a time when travelling was much less comfortable than it is at present. Kant was probably the only one who did not travel; he did not absent himself even a few hours' distance from Koenigsberg. As in many other things, he was queer also in this respect, but he liked to read of foreign lands, and in his lectures to bring in examples and anecdotes from experiences of others. Richard Wagner was actually always on the road, and Meyerbeer was always travelling, and wrote his operas, so to say, in the railroad trains.

We see, in general, a true wandering impulse among the great men, and I consider it possible that Napoleon was led to foreign countries, to Africa and to Russia, not alone by his conquering impulse, but also by his wandering impulse. This impulse for wandering, the search for the distant, curiosity for the unknown, is a characteristic feature of great men, even in their youth; and it may, therefore, be assumed that there exists a natural connection between the wandering impulse, with extensive travelling as its sequel, and the development of genius in such men. This is quite natural, because in travelling new impressions are constantly received, and we are perfectly justified in considering travelling in foreign countries as practical exercise for sharpening the senses. By perception of much that is new, and which has not been seen before, we are enlarging the store of our experience, and the gathering of new experience is equal to studying. Travelling is, therefore, practical instruction, only with this difference, that what is learned that way, on account of its more lasting impression upon our faculty of observation, remains in our memory much longer, and may be preserved there for many years. Because we are constantly becoming acquainted with new things we are compelled to make comparisons with what we have seen previously, and such comparisons stimulate thinking very much. This also explains why

most important discoveries and inventions are made or obtain their original stimulus during a journey. For instance, the voyage of arwin on the steamer "Beagle" stimulated his inspiration; and also the distant journeying of Alexander von Humboldt had a similar effect. Gibbon, as mentioned before, received his inspiration to write his celebrated book on the "Fall of the Roman Empire" while on his way to Rome. The telegraph was invented by Morse during a journey. Herder, on the lonely deck of a boat, late at night, on his way to France, received the inspiration to write his genesis of primitive poetry and the gradual evolution of mankind. Just as profitable was a journey to Java for Robert Mayer. In his capacity as ship doctor, he, on anchoring at Surabaya, performed a venesection on one of the sailors. When he saw how red the blood was he became afraid that he might possibly have injured an artery. Afterward he heard that in the tropics venous blood looks like arterial blood, and an idea came to his mind very suddenly that this might have some connection with the reduced loss of heat by the body in the tropics, and that oxidation processes must be reduced there. And so, later, he formulated his laws on heat.

The further development of many great men has undoubtedly been greatly advanced by impressions received and observations made while travelling, and in some instances could probably be attributed to that alone. So surely did the journey of Mohammed to Syria, which he took at the age of 14, with his uncle Abu Thaleb, and where he became acquainted with the Nestorian monk Sergius, who made a deep impression upon him. He came in touch here with the teaching of the Christian church, and this surely had a lasting effect upon this very intelligent youth and influenced his future life. Especially the travelling which is done during youth can have a powerful educational influence. It is precisely the same as with studying. For the latter a man is most fitted at the age when his sense-organs, by means of which he receives his impressions, are in best condition. And these are the years after puberty and from

that time on to the years of more advanced manhood. Of most importance, it seems to me, is travel during youth, because the sense-organs are then fresh and open to impressions. I may add here the statement gained from experience that the first impressions are the most permanent and lasting. Every father, whose means will permit, should send his son travelling while he is still young. It is to be regretted that the railroads, like so many of our other achievements of modern days, are so detrimental to the little romance which is left at the present day in our daily life, and which has brought to an end the wandering journeymanships. May they be revived again in the organizations of the youthful pathfinders (walking clubs)! The wandering through nature on foot, the visiting of the villages of foreign countries, instead of the large cities with their international character, may possibly give travelling a particular hue of attraction and interest. If we want to observe nature, and watch our genuine instructor in her workshop, then it is best to make excursions on foot and, for those better situated, automobile rides. In medieval times all universities had travelling funds ("Bursæ") from which scholarships were given to the students to perfect themselves in other foreign universities. Even now, Belgian high-schools, for example, send talented pupils to Bologna to perfect their education—for instance, in medicine. The expenses for it are covered by an old-established fund. It would be very desirable if the State could establish at each university several such scholarships, or, as the State rarely has money for such things, if some rich people would provide in their wills some funds for such purposes; this would certainly be a generous deed in the interest of the commonwealth. Particularly for medical students and young physicians, it would be of greatest advantage to visit in succession foreign universities and hospitals, to find out everywhere what is new and take it along. A physician, particularly, can never see enough, and no matter how old he becomes and how much he has travelled, he would always find something new to add to his store of knowl-

edge. Moreover, for the medical profession, which requires absolutely the highest qualities of intelligence, greatest acuteness of all the senses is simply indispensable, and these can be best developed by much travelling, by *seeing* and *comparing*.

The great Flemish physician, Van Helmont¹ of whose great travels in Europe during the sixteenth century we have already spoken, used to say, and that with perfect justice, that whoever desires to read in the Book of Nature, must not always fix his eyes on the same page. The more we have seen in our lives, the larger will be the size of the album of curiosities accumulated; and if then something new should occur, we can refer to the pages of this album, and by comparing it with what we have seen before, thus reveal its true nature. And to be able to see much and what is new, we must travel much. Travelling is an excellent means for increasing our power of judgment and for the development of our intelligence.

¹ W. Rommelaere, Etude sur J. B. Van Helmont, Bruxelles, 1868.

VI MEMORY AND ITS SYSTEMATIC DEVELOPMENT.

CHAPTER XXXV.

THE FOUNDATION OF MEMORY AND ITS DEPENDENCE UPON THE CONDITIONS OF BLOOD-CIRCULATION IN THE BRAIN-CORTEX.

AMONG the remarkable mechanisms in the human body there is hardly one which is as wonderful and as puzzling as the memory. It is indeed surprising how a spermatozoön can transmit continuously for hundreds of years to human beings created by its aid a hanging lower lip, an eagle nose or a dimple in the chin; but is it not still more wonderful that we are capable of recalling at our desire objects which we have seen twenty or thirty, or even fifty years or sixty years ago, and not only one object, but thousands of them? And, in addition, remember that this enormous collection of pictures, which would crowd a very large library, is preserved in such a small space as the brain-cortex. And what a legion of pictures, inscriptions, words and conceptions does it not contain! Where is there a library which can compare with it in the abundance of the most varied pictures? The famous library destroyed by Caliph Omar contained so great a number of volumes and manuscripts that the many hundreds of Alexandrian bath-houses were furnished with heat for six months without interruption. But what was this library compared with the one which anyone of our sexagenarian or septuagenarian scientists carries in his brain-cortex in the form of millions and millions of pictures, inscriptions, words, thoughts collected since his childhood! What are the seven wonders of the world compared with the fact that he, in addition, is able to summon in a few seconds any desired pic-

ture, word or thought from this enormous library, concentrated in so small a space!

That an object once seen, or a word indicating an object once heard, may be retained in the memory for many, many years is well known to every one of us. They are certainly retained, for we could not recall that which we do not possess. In a like manner, other pictures are recalled which must have been preserved for years in the form of pictures. This storehouse is the brain-cortex, as has already been assumed by Willis and others hundreds of years ago. We also know, according to the investigations of Edinger,¹ that the memory is developed better as, in the phylogenetic series, the cortex of the animal grows in volume and in number of cells.

And still, no matter how minutely we examine the brain-cortex,—the seat of memory,—microscopically we are unable to detect in it a single *picture*. We only find cells which have processes branching out in a tree-like fashion, and which are traversed by a large number of fine threads. As has already been mentioned in chapter v, 1, we must attribute an important rôle in the formation of the memory impressions to these finer or coarser threads, according to the investigations of H. E. Ziegler.² We are well able to speak of impressions which can be attributed to the various sensory perceptions acting upon us, and which are later recalled. The ancient Greeks and Romans pictured the memory as an inscription or engraving upon a wax tablet. Of course, at that time they had no phonographs, but we can, not unjustly, compare these inscriptions to the impressions produced by sound on plates of wax. The carved-in threads,—the fibrils,—then, are only of a symbolical nature, and similar to the paper impressions produced in the Morse telegraph; they designate to us pictures and conceptions. That a picture is produced by a stimulus received by the organ of sight, we observe

¹Ludwig Edinger, *Vorlesungen über den Bau der nervösen Zentralorgane des Menschen und der Tiere*. Leipzig, 1896, V Auflage.

²Ziegler, *l. c.*

in the case of the pig's eye, when the animal is killed quickly, at the moment when it has fixed upon an object. We are then able to see the picture on the background of the eye.

It seems, however, that pictures are formed, not only outside, but also inside, such as may be fixed in certain centers of the brain-cortex. Otherwise we would not be able to understand how it is possible for these pictures to reappear entirely fresh after a long period of time. The bringing to life and presenting again of these pictures is undoubtedly brought about with the aid of those fibrils which traverse the dendrites and axis-cylinders of the nerve-cells on their way toward the various centers. That these fibrils which run through the processes and their branches make connection with a great number of cells we have already mentioned. But we have also mentioned that these processes, which interchange with the most varied nerve-cells and serve the purpose of association or the linking of thoughts, become changed through numerous, most varied stimuli, as, for example, by sleep-producing remedies, and thereby their plasticity, that is, their changeability toward outside influences, is proven. It was also mentioned that the development of these processes, according to the investigations of Berger in the laboratory of the psychiatric clinic, in Jena, is enhanced by the use of the senses; that is to say, by the influence of outside stimuli. That these processes must play an important rôle in the memory is evidenced by the fact that in the most grave disturbances of this faculty, as in progressive paralysis, for instance, these processes in particular are mostly affected, and may even disappear. Ziegler also points out that the gravest forms of mental diseases are those in which the connections between the cells—that means the continuity of these processes—are broken down. The more these connections are destroyed, the greater is the loss of memory. For an explanation of the process of memory Ziegler alludes to the conditions existing in certain protozoa, the rhizopodes. There are rhizopodes whose processes bear a great similarity to those of the

neurones. Similarly to the latter, their processes branch out in very minute branches. This similarity is so much pronounced that Rabl-Rückhardt, Tanzi, Lépine, Duval, and others, have based upon it their theory of the ameboid nature of these nerve-cells.³

By means of the most varied mechanical and chemical stimuli, it is possible to produce the same pearl-necklace-like changes in these processes as are found in the neurones. This has been observed, for example, by Max Schultze⁴ in *Actinophris eichornii*, and also by Verworn⁵ in a great number of protozoa. In both cases the pearl-necklace condition is the result of the irritability of the protoplasm.

Now, Ziegler points out that those processes in the rhizopodes which have found food become thicker and longer. This is the consequence of the normal stimulation which the food produces. Very similar stimuli for the nerve-cells of the brain-cortex, according to Ziegler, are the most varied impressions which act upon these cells; they are molecular movements which take their origin in the organs of senses and are transmitted by means of the nerve processes. The transmission of the nerve-stream is supposed to produce an enlargement of the branchings of the nerve-cells. This stream is also supposed, however, while traversing the body of the cell, to cause within the protoplasm itself either the formation of a new fiber—a fibrilla, or an enlargement, or we might better say, a thickening of a fiber already existing. This differentiation taking place within the cell would then be the result of the plasticity of the nerve-cells, which, according to Ziegler, form the cytological base of the memory.

According to these explanations given by Ziegler we can easily conceive that when a stimulus, a word or thought, had

³ Azoulay et Klippel, quoted after Ziegler.

⁴ Max Schultze, *Das Protoplasma der Rhizopoden und der Pflanzenzellen*. Leipzig, 1863, S. 11 und 17.

⁵ Max Verworn, *Die Bewegung der lebendigen Substanz*, Jena, 1892.

very often followed the same path, was therefore transmitted by the same fiber, the latter, by analogy with similar processes in pathology, would become thicker. In other words, "the thought, the word, the picture are then deeply engraved and can easily be recalled to memory." When, however, the application of these thoughts or words is not practised any more and the trail thus remains unused, the respective fibers will not receive nourishment any more, the impression will fade away, and the whole thing becomes forgotten. We can only remember those things which, by numerous repetitions, have been well anchored. In view of the fact that every day new impressions, coming from all sides, act upon us, the terminal branches of the nerve-cells establish new relations with neighboring cells, new tracts within the cells are formed, and the neglect of the previously formed results in their fading away and being forgotten.

In these processes a very important rôle must be played by the conditions of the blood-circulation in the brain-cortex. Even if it is not justifiable to accept the assumption made by Golgi,⁶ that the arborizations of the association cells, and possibly of other nerve-cells as well, by means of processes reach to the surface of the cortex, and there enter relations with the blood-vessels in that locality, it is certain that the ganglion cells enter connections with the blood-vessels by means of the glia. We also know that there is no thinking possible without blood-supply. If we want, however, to incorporate something into our memory, be that an object which we saw or a word which we heard, we must take good notice of it. We must be watchful and pay attention to it, consequently must think of the word which we heard, because only in this way are we able to fix it in memory. If we are absent-minded, we are naturally not able to take notice of anything.

It has often been mentioned that for thinking blood is required. In fact, experience teaches us that we remember such things best which we have heard or seen at a time when our

⁶ Golgi, *l. c.*

blood-circulation was most active. When we are under influence of some emotion, the blood-pressure is raised and the blood-supply to the brain-cortex is increased, and everything that happened to us at that time is vividly retained in our memory. This also explains the fact, as seen from the experiments made recently by Peters, that we retain much longer occurrences associated with pleasure than those associated with displeasure; the fact that we look back with pleasure on agreeable events prevents their fading. According to Herbert Spencer, sometimes entirely trivial, unimportant incidents are retained very well in memory, if they happened to take place at a time when, on account of some pleasant impression, the activity of the heart was increased. This is also the relation which exists when we sometimes find that the insane show a distinct memory for entirely unimportant details, which have been perceived during their condition of maniacal exaltation. They give then a full minute description of the smallest details, even if a long time, sometimes years, has since passed. As an example I may mention here the case of the murderer Farina, who suffered from persecutorial insanity, and whose own description of his miserable deed and of the circumstances which led him to it are published by Lombroso. He mentions the subject of the conversations with himself, of his various dreams in all their details; he even gives the measurements of a piece of soap which was given to him by the mother of his sweetheart some time before the deed took place, and even also the words which had been spoken on that occasion. And all these details some years after the crime.⁷

When we are able to recall often in our memory some small things from our childhood days, when incidents which have occurred many years ago stand out before our eyes in fresh colors, this may possibly be attributed to the fact that in the growing child the blood-circulation is very active and, there-

⁷ Lombroso, *l. c.*, S. 289.

fore, insignificant occurrences, only on account of their newness, cause a pleasant emotion.

On the other hand, it is impossible to retain impressions when the blood-circulation in the cortex is low. After a good and large meal, when the whole amount of blood or a part of it rushes to the digestive organs, we are not able to take notice of anything, or it is done with difficulty, and we are not able to retain anything in memory. The same is the case when we are sleepy, and this is for reasons which we have already mentioned. When we, by partaking of strong coffee or tea, induce a lively flow of blood toward the brain we are able to impress everything better into our memory; when we, on the other hand, take a sleep-producing remedy, and in this way cause a lowering of the blood-circulation in the brain-cortex, the opposite effect occurs.

When old people retain everything so badly in their memories, this must be attributed mainly to the lowering of the blood-circulation in the brain. Contrasting with it stands the good, clear memory of the children, in whom the circulation in the brain, as just mentioned, is a very active one. It must also be remembered that, while children, it is true, learn quickly, they also forget quickly. The example of a 3-year-old child, which in two months had learned German and French, but had forgotten its mother tongue, the Hungarian, I have already mentioned.

This rapid forgetting in children is to be attributed to the fact that in children the process of memorizing is more of a mechanical act, which is, properly speaking, not connected with a thinking operation, and is not based upon associations. The child notes everything best by repeating what it has heard, and recites it then in about the same way as do parrots. Our wrong system of education is so adapted that it does not leave any other way open for memorizing. By grinding it is possible to inculcate everything, even Chinese, Assyrian, Greek words which are not understood; it is only necessary to repeat them a thousand times, then the children will retain them until their old age.

I should like to distinguish between two kinds of memory: 1, the recitative; 2, the associative. The first has nothing or very little to do with thinking; it is acquired by much repeating, and soon becomes lost. The second is a process of memory which is based upon thinking. What we have seen, heard or felt, what we have smelled or tasted, becomes associated with a number of other sensations and perceptions. This is the higher kind of memory. Moreover, the word "gedächtniss" (memory) is derived from "gedachten" (thought over) from "denken" (thinking). The first, which means the lower form of memory, we find, as already said, in children; also in some bright animals; also in some idiots. Some of the latter, for instance, have a surprising memory for figures. Some idiots repeat the same thing often for hours. Gall⁸ saw in the Vienna General Hospital an idiotic man, whose only occupation consisted in counting. He always stopped at 99. Gall could never induce him to say 100; he always, again and again, started with 1 and stopped with 99. Moreover, the idiots who are sometimes found in insane asylums are great on figures, but do their calculating only mechanically and not by thinking. As a rule, their calculations consist in multiplication and addition, but they seldom understand subtraction or division. This good recitative memory distinguishes the so-called pluggers, who, unfortunately, are often considered the best pupils. It enables them often to pass their examinations successfully, and so we may observe that pupils of a low grade of intelligence are considered as the best in their classes; sometimes even, on account of their brilliant examination marks occupying important positions in public life. In school and in the university they plugged; in life they imitate the faculties of others, as they have none of their own; and thus, with a medium intelligence, these mediocres not rarely obtain high offices and position. From this class geniuses have never been furnished.

⁸ Gall nach, quoted by P. J. Möbius, *Die Anlage zur Mathematik*, Leipzig, 1907, S. 291.

CHAPTER XXXVI.

CONDITIONS REQUIRED FOR A GOOD MEMORY.

IF we want to memorize anything we must, first of all, take good notice of it. But to do that properly we must give our full attention to the object which we see or to what we hear. Some things will, however, excite our attention only when we are interested in them or they are stimulating to us. The greater the interest the greater the impression which such a stimulus from outside has produced upon us, the more forcefully will it be incorporated in our memory. We have mentioned before that we are induced to think simultaneously with the attention we pay to an object or to a sense impression, and that this stimulates the blood-flow to the brain. We also said that such an impression, similar to that of an electric current, penetrates into the nerve-cells and produces plastic changes in these cells and in their processes. The greater such impressions are and the more frequently they are repeated, the stronger and the more effective will they be; the impressions will become permanent, and consequently be stored up.

It may be assumed that such an electric-like nerve current, when it passes through the processes which form the contact between the various nerve-cells, brings about the greatest modifications in the nerve-cells which are situated directly in its pathway. But the cells in the neighborhood will also feel something, although less, of the shock, and will also undergo more or less changes. This will find its expression in the fact that we will notice best the main characteristics, which means the *essentials* of what we saw or heard. If we are impressed with a picture, say, for instance, with the sight of a landscape or a portrait, or by hearing a lecture or a story, the side points, which means the side lines of the picture or story, will be less well retained, because the impression is less strong, and will also be less

well stored away. Indeed, we actually see that the artists bring out in their pictures more prominently the main features and work them out most carefully, whereas the details of scenery, the environment of the landscape, are not brought out so precisely. Only in the paintings of the primitive artists of the fifteenth and sixteenth centuries we see details worked out with great pains, as, for instance, the hands of St. Ursula of Köln in the pictures of Memling, which we can admire in St. John's Hospital in Bruges. But we see something similar in persons with a primitive kind of thinking. Children and fools often remember small details, and we have already mentioned some examples of children's ways of thinking; how they pay attention to minute things, just because these excite their interest more. In some women it may also be observed that trifles often excite their attention more, and such women may also be more predisposed to a narrow way of thinking.

That the insane often have an acute memory for small details, we have already mentioned. Here I would like to relate a case which came under my own observation, which shows that some of the insane have a special memory for locations. In the Insane Asylum at Nizza I saw a patient 67 years of age, who suffered from persecutorial mania. This patient acted as a bookkeeper for the institution for over twenty years. I could never enter into any kind of a sensible conversation with him, but this fool had such marvellous memory for location that he was able to locate at once any item in the registration book, dating years back. He was a living catalogue. The ability to notice small details may sometimes be of great advantage in recalling greater objects by incidents which may have been connected with these details. It is here the same as with the tracings of a detective, who sometimes, from some insignificant detail, finds a clue to the discovery of a looked-for criminal; small traces lead him to find greater ones. The small details are associated with the greater things; if we pull on the little finger, the whole hand is drawn. In a like manner we are able,

by some small things, to recall greater things, which have been lying buried in our memories for years. As an example I will relate a chain of thoughts from my own experience. Last autumn I took tea with a Dutch-Indian family, who are friends and patients of mine. The mild tea, with its agreeable taste, reminded me of a similar tea which I drank years ago on a tea plantation of a colleague of mine, at Somerville, in South Carolina. The wonderfully beautiful, almost tropical landscape, reappeared before my eyes, and also the "Pine Forest Inn" where I stayed for a week. It also brought to my mind the picture of the full-blooded horse, Alice, which ran away with me, and that she was trained only two days before; also that the colored riding master forgot to give me a "curved bit" rein. This made me think of the docile, broncho horses on which I rode from the possessions of my host and friend, Don Manuel Rivero, in Mexico, near Monterey, Province of Nuevo Leon, to this farm, located many hundred meters high in the mountains. This reminded me of the town Monterey, with the old Fonda Iturbe, and how one day during dinner a rat chased by dogs ran into the dining-room, and while the ladies jumped on the chairs, the rat was killed under the table. Then, again, I thought of the beautiful possessions of my friend and patient Rivero, and I asked myself how he and his family were doing in these turbulent times, and how my friend and colleague, Dr. MacMeans, in Monterey, was doing. I also thought of the patient from the United States, whom he sent me, who had charge of newspaper agencies, and I wondered how he might have gotten along during the revolutionary struggles, and whether he was still alive. I also thought of how another of my patients, Mr. T., in Mexico City, with his six beautiful daughters, may have gotten along. I also recalled that he was recommended to me as a patient by the late Professor G., in Berlin, and that I had lately met a lady from Berlin who knew that family very well. Thus we see how, through association, one picture brings back to life many others, long buried, which

would have otherwise slumbered for years in our museum of old memories. Indeed, what a wonderful arrangement of nature! And how useful would it be to make frequent inspections of such old pictures to prevent them from becoming discolored and faded away.

These associations of various subjects are also of great importance when we want to get a good impression of something and keep it in memory. By linking a less interesting picture with a more interesting, the attention is more excited, and thus their fixation and retention are facilitated. This is of particular importance when we wish to help children in memorizing. A child thinks concretely, as we have already said; it knows, in general, only the objects which surround it, and it is interested only in things which seem to have some value to it, and are characterized by tastiness, pretty color, lively noise, etc. It is for that reason that vivid color impressions should also be used to develop the memory, in teaching, as we have mentioned in other parts of this book. A child also shows most interest for things which belong to it, or have at one time belonged to it. But because it has only concrete ideas, whereas abstract ones have to be taught it, it is an egoist, and at the same time a materialist. It will be then the object of education to make of the materialist an idealist.

As said before, children have interest in things which they can see, touch, taste, which they like and can also have. They observe such objects best; they keep them most easily in their memory, and it is the easiest for them to recall them. When children hear something which they do not understand, they naturally do not notice it as readily; they become weary, and their thoughts wander away.

This absent-mindedness, which occurs very often in children, is a great obstacle in memorizing and learning in general. We will speak of this later more in detail, and here I would only like to mention that I distinguish two kinds of absent-mindedness. The first one is caused by inability to pay atten-

tion to any kind of a subject, and we find that particularly in children who are sickly, have adenoid vegetations, are anemic and badly nourished. The second kind is caused by paying too much attention to one subject, and thus becoming detracted from all others.

The first kind we find, besides in children, most frequently in idiots, who try to memorize what they hear by mechanically repeating it. What they have learned is soon forgotten again, because, contrary to the memory due to association of ideas, here in learning no conceptions are formed; no mental pictures, with their essential and incidental characteristics, are formed and retained. When things are repeated very often, even in this case, what has been learned may be retained in memory for many years, or forever; and we, indeed, see many people who are able to rattle down long Greek verses (the meaning of which they no more understand) even after twenty, thirty, forty and fifty years; and this is an example of the brilliant effect of grinding during childhood. Something similar we see in the parrot. As an example I would like to repeat here the story about the parrot of a Dutch physician, Dr. Lucas Stevnick, of Middleburgh. This colleague was a very prominent political figure in the history of Zealand during the end of the eighteenth century. He had a parrot which, every morning, when the doctor came downstairs and entered the dining-room, would greet him with the words, "'Dag, Dokter" (Good morning, Doctor). When the doctor, on account of his political activity, had to flee (he was wounded by the savage mob and had a narrow escape alive) and the parrot did not see him any more, it became dumb. The bird remained silent fully eight years, until its owner was permitted to return home from exile. As soon as the doctor entered the room the bird opened its bill, which had been kept closed such a long time, and greeted him with the old exclamation, "'Dag, Dokter." I came across this story accidentally in studying the descriptions of the life his-

tories of prominent Zealand physicians, published by two colleagues.¹

Some intelligent animals, as dogs, for instance, must have, however, some associative memory. Such a case I have observed in a fox-terreir, which, as is well known, belongs to the more intelligent animals. Christmas, 1897, I was visiting my friend and patient, Mr. Charles W., in Wirksworth, Derbyshire. The host went into the cellar to look for a bottle of seventy-year-old port wine in honor of his guests. All at once we heard the terrible barking of a dog. What was the matter? The host gave us the explanation. The clever animal, about ten years before, had killed a rat in the cellar, and every time he saw anybody going to the cellar he barked furiously. The rat, which was killed ten years before, was supposed to be the last in the cellar, and, therefore, the excitement of the dog could not be attributed to any sensation of smell, revived by any rat which had been there recently. It must be assumed that the dog's process of association was reminded of the wild chase of ten years ago.

The associative memory has the great advantage that with one grasp a large number of pictures, like one bunch of grapes, are plucked from memory. We have already mentioned that some incidentals may remind us of important essential characteristics; and, on the other hand, some main characteristics may remind us of side pictures, of some non-essential details. Whenever a lady looks at a new hat which she wears, she is always reminded of the place where she bought it, how much she paid for it, the name of the salesperson, etc. But such associative memory can exist only for objects which are of great importance to us, like a new hat is for a luxurious woman. The main feature here is, as already said, that we are induced to think.

The thinking which is necessary for reawakening of associative perception pictures is the cause for these being better

¹Dr. A. Fokker en De Man, *Levensberichte van Zëeuwscher Medici*. Middelburg, 1901, S. 157.

noticed, better preserved in memory, and being more easily recalled. These three processes are the three necessary prerequisites of a good memory. To be able to impress something deeply into our memory and dispose of it at will, we must: 1, notice well; 2, preserve well; 3, be well able to recall.

We can therefore understand why that which we have learned slowly is retained longer, and that which we have learned rapidly is quickly forgotten. In the first case, we remain at the picture until we get a distinct idea of all its associations; in the second case, we do not get this. For this reason children forget very soon; they are often absent-minded, show little interest, and do not think over things; neither do they possess any store of facts from experience to which they could link associations. The child has not yet had any chance to accumulate in its memory pictures of objects seen, before, which would enable it to make comparisons and associations. Of course, there are exceptions, where children know everything, notice everything, are exceedingly inquisitive and eager for knowledge, and what they have thus learned they retain until their old age. A brilliant example of this was the famous scientist Ampère. When he was a child he eagerly read everything through that came his way, and so he swallowed the twenty volumes of an encyclopedia which he found, and when he was an old man he could still recite many sentences from it, word by word. Such brilliant memory is, of course, possessed only by geniuses, by the great minds. Particularly frequently mathematical geniuses have such wonderful memories. So we find it, for instance, in Ampère, Thomas Young, my countryman Bolyai, Condorcet, James Watt, and others. When already on his death-bed, the geometrist, de Lagny, could remember the quadrate of a number, and when Maupertuis asked him how much is the quadrate of 12, he answered without further reflection 144. That geniuses have such a good memory is only natural, because they are just distinguished by this ability to devote their attention in the highest degree and continuously to one

subject. Of course, depending on the vocations and occupations of each individual man, the interest which is taken in a certain subject, and therefore the attention given it, would vary. Corresponding with it would also be the recollection. An artist would notice a characteristic detail in a picture, or in a landscape; a musician would notice a sound or a tone; a physician would notice a symptom, and all three of them would easily recollect those respective things when necessary; and at every opportunity they would be able to recognize them again, while everyone else outside of those professions would surely be unable to do this.

The interest which we take in an object would, as we have already mentioned, not only make it possible to notice and retain the picture in memory, but also make it easy to recall from the storehouse of memory. When we see something new which differs from everything else which we have known, it will strike us particularly, and we take great interest in it. On the other hand, we will be curious to look at it, and take so much more notice of the details the more it strikes us with its novelty. If, then, we should happen to see such a picture again, even many years after, it will look familiar to us.

The same is the case when travelling through foreign lands, and meet something which we heard much about, or that we have read about. It awakens at once our particular interest. We fix this picture forcibly in our mind, and never forget it. During my travels in the English provinces, Devonshire and Cornwall, undoubtedly the prettiest part of England, my attention was particularly attracted by the beautiful Celtic crosses, which were almost one thousand years old. Because I had always taken a particular fancy to all that had been reported about the mysterious Celtic race, these crosses have attracted my particular attention, and I wandered in the surroundings of Penzance, Land's End, Cape Lizard, for hours to see them. These brought to mind the remarkable similarity of the language of people so widely separated, as the Welsh in Wales;

the old Celtic language of Cornwall, which is no longer spoken, and the Gaelic language of Scotland; the language of the Irish and the Bretons of Bretagne (in Morbihan, Calvados, Finisterre, etc.); of the Basks in the Pyrenees, where I remained for some time. And then, again, came to my mind the mysterious relation between the language of the old Aztecs and the Basks, of the similarity in the language of the primitive natives of Mexico, the progenitors of the Aztecs (Toltecs, Mayas) with the idiom of the old Egyptians; of the peculiar connection of many, even very many Welsh words with the Greek, as, for example: Artanbread, Arthos in Greek. This led me to the thoughts of the peculiar resemblance of so many regulations and costumes, as, for instance, the head attire, which, according to a photograph, was worn by the Ethiopic ruler Emperor Menelik, greatly resembled that of Montezuma. The Ethiopians are indeed supposed to be identical with or related to the scattered people of the Pharaohs. The sight of the old Celtic crosses brought out these past recollections of what I had read and seen years ago without investigating whether all was correct or incorrect.

I only mention this here to show how, by associative memory, or recollection, often a passionate interest may become awakened for study and investigation in a particular direction.

I consider this as very important, and would call attention to the fact that mankind is often under obligations to such accidental associations for its greatest discoveries and inventions. If the streams had not brought from America to the European coast plants, timber and other things, the discovery of America by Columbus might not have taken place.

Sophus Lie never thought of becoming a mathematician. When he was 26 years old he got hold of the works of Poncelet and Plinker, and from that time on dates his great passion for mathematical sciences, and when a man works with passion and with greatest interest he will be most successful in obtaining best results.

The great interest which we give to a subject is the reason why we see it better. We notice then a good many things which other people do not see, and this is of utmost importance for impressing something in our mind, and for remembering it. Any picture which we want to incorporate into our memory we must absorb, the same as an artist does when he makes a painting. First we must notice the main features with utmost precision and the side features or the characteristic details. The latter in particular, because it may happen that in course of years some of the main features will vanish, and then we are able, by means of a single characteristic feature, to recall again the entire picture. Everything, therefore, that we consider worth while to retain in memory we must, in order to fix it sharply, look at it as long as possible, about in the same way as when we want to take a photograph; and when we see such a landscape or a person which we have fixed in its time, even years after, we are then able to recognize it or him at once. A good memory manifests itself by the fact that the process of recollection is a rapid one, and only a few minutes pass between the time of seeing an object and recognizing it. Anyone who has a good memory would, at the same time, be reminded of some other important and sometimes even of unimportant details. Sometimes we are able, as already mentioned, from accompanying, surrounding details, to recognize a person, but when the latter is separated from his usual surroundings, and the milieu which had otherwise given a support to our memory is changed, then the recognition becomes much more difficult. This probably explains how it happens that when we know a person, without knowing his name, perhaps by sight only from having met him on the street, at home, or in Carlsbad, or Vienna, we do not remember where to put him when we happen to meet him suddenly, several months later, in Malaga or Lisbon, or somewhere else in a distant land, outside of the usual environment. The face is familiar, but where have we seen this lady or this gentleman? Only when the husband or the wife or any other

of the acquaintances join them do these associating details help the memory.

If we want to remember a picture very well we must look at it repeatedly, even very often; then so many more details will be impressed in our memory. I have observed this in myself with an experiment with the kinematograph. I looked in the kinematograph at the same occurrences, the same landscapes, the same scenery quite often in succession. Notwithstanding that I watched it carefully the first time, I saw some new details on the second, third and fourth time, which I could fix in my memory. We know, moreover, from experience that when we read a book several times we find every time something new, which we did not take notice of before.

If we have sharply fixed and perceived an object in all its outlines the first time, and besides that, have looked at it repeatedly, it will be so much easier for us to remember it well. This is the fundamental condition for a good memory. The time required to recollect something will, however, be not alike in every person. A young man, even after years, would recognize in a second a picture, fixed in the above-described way, as something familiar, seen before, and will also remember its correct name. An old man would have more difficulty; he would have to reflect a little longer where he has seen that face or heard that voice. The reason of it is that the blood-circulation is most favorable in a healthy young man; also the ductless glands, as the thyroid, for instance, the importance of which we know, are more active in a young than in an old man. If a person is dying and the heart begins to cease its activity and the blood-supply to the brain is lessened, he does not recognize his relatives any more. When we are sleepy we sometimes do not recognize things very quickly, and cannot recollect things so vividly, as in the early morning when awakening. In the first instance there is a slowing down of blood-circulation in the brain-cortex, the blood-vessels are contracted, but in the last instance the blood-circulation begins to be very active. The conditions of

blood-circulation in the cortex have consequently a great influence upon the memory. This is the reason why sometimes after great emotions, as it happens occasionally after an accident, events which have occurred in childhood arise vividly before us. Ribot² asserts that people who have been in danger of drowning have seen their whole lives passing before them at that minute, and even also with great acuteness the events of most remote childhood. These pictures of most various deeds emerge like in a panorama, and are accompanied by the feeling of having done right or wrong. A similar assertion has been made in regard to opium by de Quincey, the well-known great English writer, who was addicted to the use of that drug, in his "Confessions of an Opium Eater." He says that in one night he lived over from seventy to one hundred years,—all the details of his childhood and forgotten events of later years. Here, too, belongs the case of Forbes Winslow.³ A man fell between the rails and a whole train passed over him, without doing him any injury, but during that time all events of his life passed before his eyes with surprising vividness. The same conditions have prevailed in the fact which is reported by Rush⁴ about a Lutheran minister in Philadelphia. The minister told him that his old Swedish penitents, when lying in bed very ill, and becoming very emotional by the thought of approaching death, that they recited long Swedish prayers, notwithstanding the fact that they had not spoken that language for fifty or sixty years, and had apparently entirely forgotten it. The same processes are at work when, during the death agony, often the parents which one has not seen since childhood, are called for, and this is even done by old people, whose parents have been dead many years. It had been observed that during a battle death-stricken soldiers collapse with the names of their parents on their lips, even though the parents have been dead. It generally follows that to

² Ribot, *Les maladies de les mémoire*. Paris, 1871.

³ Forbes Winslow, quoted after Ribot.

⁴ Rush, *Medical Inquiries and Observations of the Mind*, p. 277.

every man, even to the worst one, during the peril of death, in the death agony there come recollections of his childhood days, and his disposition becomes softened; and those sentenced to death, even grave criminals, call the names of their parents when they are being executed, as I have observed myself in two cases. During my childhood days I saw, in my home town, Nagy-Kanizsa, in Hungary, from a tree in the garden which adjoined the prison-yard, the execution of two murderers. When they were being pulled up on the gallows, the first, as well as the second, who followed him, called "Father," "Mother." Impressed by this I, then 6 years old, clenched my hands in impotent anger against the executioner and damned him in very expressive words.

CHAPTER XXXVII.

CAUSES OF WEAK MEMORY AND ITS TREATMENT.

DURING my visit at the insane asylum at Nizza, while Dr. Pietri, the director of the male ward, was showing me around, one of the insane, a pensioned captain, decorated with the ribbon of the Legion of Honor, came forward and asked him for permission to go out and collect his pension of 365 francs. Dr. Pietri told me later that for the last three months this patient, in a most unconcerned way, appealed to him with the same request every morning. He repeated it from day to day, and could not remember that he had already made it.

When we inquired from another patient in the same ward what he had had for breakfast an hour ago, he answered that he had two eggs, one-half of a roasted chicken and some other delicacies, which certainly never appear on the breakfast menu in a State asylum. He assured me of that in such a natural, undeceitful way that we could not assume that the wish was here father to the thought. I was, moreover, told by Dr. Pietri that this patient was unable to remember anything, and when he did recollect something it was in the wrong form, as we have just seen. Both patients suffered from the gravest form of mental diseases, from progressive paralysis, in which loss of memory is also manifested in its gravest form. This is due to the fact that in this disease the two factors which are injurious to the memory are working together in their highest potency:—

1. Disturbances in the blood-circulation of the brain-cortex, due to changes in the blood-vessels.

2. Destruction of the nerve-cells and nerve processes, the great significance of which for the memory we have spoken of before.

Not only in progressive paralysis do these changes occur, however, but also in various degrees in other diseases of the

brain; for instance, in senile dementia. It is characteristic of paralysis that the memory becomes progressively weaker, and no thought of cure can be entertained. Sometimes the beginning of this dreadful mental disease may be recognized by the fact that the memory gets worse, which is a typical diagnostic sign. How often have I heard from such poor patients, when I have asked them how they felt, "Thanks; very well." From this answer alone I could draw a conclusion about the nature of the disease. This feeling of well-being may be due to the forgetting of all that has happened, all bad and evil. It is a charitable act of the Creator to wrap the mind of these unfortunates with a dense veil,—as only too often we find among them men who previously had great mental powers, such as Nietzsche, for instance,—so that they may not become aware of their fearful fate and the suffering of their families. We should, indeed, be thankful to nature, that when a man receives a fearful shock, or is in mental agony, or suffers from an unbearable grief, mental darkness sets in and charitably spreads its wings over him.

In the case of Nietzsche there was, in the beginning of his illness, a particular feeling of well-being, and the weakness of memory developed very slowly, in a lingering way, as is very often the case in paralysis. The sudden forgetting of an important intention, of an old-accustomed action, of an urgent duty, is often one of the first signs of the malady.

Syphilis, which is the fundamental cause of this disease, may injure memory very gravely by producing also other brain and nerve affections, such as arteriosclerotic changes in the brain, tumors developed on a syphilitic base, as well as other changes. All these disturbances of memory are, as a rule, of a progressive nature, and, according to Ribot, it takes place in the following order: memory for recent events is lost first, and then follows loss of memory for occurrences in years back. In the first place, general conceptions become forgotten, then follows loss of memory for feelings, and in the last instance recol-

lections of actions. The law of retrogression of Ribot shows that the loss of memory affects first the new events, then the old ones, and is then continued automatically, from the complex conceptions to the simple ones, from the voluntary acts to the involuntary. It seems, therefore, that there exists a general law according to which last-formed association connections first become destroyed, and memory impressions laid down long ago follow next. Verses, moral teachings, proverbs, etc., which have been retained in memory by reciting, are lost latest of all; this is probably mainly because they have been repeated many hundred times, somewhat as is the case with prayers, and the latter a man does not forget even on his death-bed. What we have learned in school, what we need to repeat daily, such as languages studied, principles of various scientific branches, which we at the time understood well and have repeated numberless times, are most firmly retained. When we find in a patient the loss of even such firmly laid down conceptions, words, pictures seen, then we can draw the conclusion that we have to deal with a very grave disease, which has affected the nerve-cells themselves and their processes. The prospects for a cure are then less favorable. Sometimes grave losses of memory may, of course, be of a temporary kind, and in course of recovery the former memory may again be restored. We are then able to observe how, according to the reverse of the above-mentioned law, as a rule, the last thing forgotten returns first, and then the others follow in consecutive order. Taine¹ observed the case of the Russian astronomer who first forgot the latest events, then those of the last year, and then those of former years. When he improved, the remembrances of childhood returned first, then those of his middle life, and only in the last instance those of recent times.

We have already repeatedly mentioned how much the memory is affected by the conditions of the blood-circulation in the brain-cortex. In case larger areas of blood-vessels are

¹ Taine, *De l'intelligence*, t. i, livre 11

destroyed, as a rule, a permanent loss of memory is the result. If, however, the disturbance in the blood-circulation is only of a temporary nature and the destruction of the blood-vessels is not incurable, the memory may again be restored; we have then to deal with a temporary weakness of memory, with a temporary amnesia. Such cases may originate after serious accidents, whereby the blood-circulation is disturbed by the shock. We know that as a result of shock the blood-vessels of the abdominal viscera become dilated due to the paralysis of the splanchnic nerve, and only very little blood streams to the brain. Memory can be affected very badly on account of this, and sometimes it is as if cut off, so that recollections from childhood, which are otherwise retained until old age, are lost. Such cases have been often reported, and I may mention here a case of Forbes Winslow.² A minister was thrown out of a carriage and received a shock. As a result he became mentally like a child with a natural intelligence. English and Latin, which he had studied before, he had to learn again from the teachers. A few months later the languages returned to his memory without any interference from outside.

A similar temporary loss of memory after a shock was manifested in the interesting case of a young woman, who during the birth of her first child had a fainting spell, and she forgot everything which had happened since her marriage. She even pushed away her husband and her child.

Such temporary losses of memory are not rarely connected with epilepsy. Take the case of Trousseau. A judge read a paper in a scientific society. In the middle of the reading he had an attack; he walked without his hat to the wharf, came back again and continued the delivery of his paper. Besides the cases of progressive or temporary loss of memory mentioned above, which are either incurable or the cure is a very difficult one, there are a great number of less grave disturbances which can very well be cured, or considerably improved. Most frequent are the

² Forbes Winslow, *l. c.*

cases which may be observed in conditions of degeneration of the thyroid. For instance, patients suffering from myxedema forget very easily all events which have taken place recently, whereas those which have taken place in childhood remain fresh in their memory. That we are dealing here with changes in the thyroid is evident from the fact that a considerable improvement may be noticed when animal thyroid is administered (see chapter iii, 9, and iv, 7). Into this domain also belong weaknesses of memory observed in old age, which I also attribute to a degeneration of the thyroid. Old people also remember more distinctly what has happened during their youth. They have been at that time better able to notice events and retain them; they have also frequently recalled these events to memory, whereas they were not able to fix as well in their memory recent events. I have, however, mentioned in "Old Age" that degeneration of the thyroid is not necessarily found in all old people; and, therefore, we do not rarely find also among them a very vivid memory, not only for events of their younger years, but also of those of recent date. A very instructive example was old Euler, who was one of the greatest mathematicians. He gave instructions in arithmetic and geometry to four of his grandchildren, and to instruct them in extraction of radicals he figured out in one sleepless night the first six potentials of all numbers below twenty, so as to have appropriate examples on hand. He also retained them so well that he could recite them for days. He was then 76 years of age, and could recite the whole "Æneid" from beginning to end.

We find very frequently also disturbances of memory in other conditions of weakness of the thyroid, as in simple hypothyroiditis. Memory, for instance, is very often affected during convalescence after serious infectious diseases; also the power of perception and fixation. When we find weakness of thyroid, which, as so often mentioned, plays here a great rôle, also participates. Also in children manifesting signs of hypo-

thyroiditis—very many children have this—we often see disturbances of memory, particularly when such children are, as is often the case, suffering from adenoid vegetations. We observe then great forgetfulness; the power of perception and fixation, as well as of memory, is badly injured.

Very injurious for the memory are also all toxic substances which injure the thyroid, particularly alcohol. In Korsakow's disease, which is caused by alcoholism, we find, besides paralysis, also forgetfulness in highest degree. The various sleep-producing remedies, which lower the blood-pressure and may empty the blood from the brain-cortex, are also very injurious to the memory. That the memory thereby suffers very much is evident from what has already been said. Bromide particularly injures the memorizing process very greatly, as I have observed very often in epileptic patients treated with that remedy. If, then, by administration of thyroid we obtain an improvement of memory, we attribute it to the improvement of blood-circulation in the cortex, due to the thyroid.

Injury of memory we also find in various bodily ailments, in which pain and other complaints claim very much of the attention, and thus disturb the perceptive ability, or when the production of toxic substances takes place.

It can be easily understood that if anybody has an intense headache, he cannot perceive anything. The same is true of digestive disturbances, which, as is shown by Plönnies, act very injuriously by means of the toxic substances they produce.³ Very frequently we observe this in anemic, chlorotic girls and women, and here the cause is also poor blood-supply of the brain-cortex. Often anemia and toxic substances originated in the digestive tract work simultaneously. Plönnies observed great improvement of memory after digestive disturbances were cured. I have been able to observe similar effects in my patients with digestive disturbances, after good results with mineral waters.

³ Plönnies, *Zeitschrift für Nervenheilkunde*, Bd. xxxv, S. 74.

Great disturbances of memory may result from protracted insomnia. In this case also it must be due to retained toxic substances, because sleep, as already mentioned, is a process of disintoxication. Ranschburg⁴ often saw the perceptive powers improved markedly after purging. In general, by proper hygienic mode of living, we are able to influence favorably most disturbances of memory, if they are not caused by some organic changes in the brain. In the first place, it is necessary to attend to the improvement of the blood-circulation in the brain, according to the principles laid down in chapter ii, 2, and also take notice of the hygienic hints given there. Most frequently we find disturbances of memory in neurasthenics, the mentally overstrained. We can observe often in students that their power of perception and fixation is impaired when they prepare themselves for examination. They cram their heads with all kinds of junk, and, in addition to that, deprive themselves of sleep, and the result is that during examination, memory, in spite of all their diligence, forsakes them. Such individuals should always be advised to give up all their work for six or eight weeks, and take a rest in the country or in the mountains. It is surprising how often memory improves after such an entire rest of the mind for several weeks. This is probably also the reason why students pass their examination better when, during the last few days before examination, they do not study at all, and do no mental work whatever, because their brain is then better rested. After all, examination is only a test of memory, or a test of what has been retained in memory, because, as Kant said: "*Tantum scimus quantum in memoria tenemus.*" We may have learned ever so much; it all amounts to nothing, if we in the critical hour are not able to give an answer to the question put to us by the examiner. Many a one does not pass an examination just because by filling his head with too many details he injured the memory very greatly.

⁴ Ranschburg, Deutsche med. Woch., 1912.

CHAPTER XXXVIII.

SOME HINTS TO FACILITATE MEMORY.

WHEN we make an attempt to retain in memory something that we have seen or heard, so as to be able to recall it at any time, we must, first of all, distinctly fix that given person, object or event, or think for some length of time about what we have heard. At any rate, we must make a stop, eliminate all other thoughts and concentrate all our attention upon the subject which we desire to keep in mind. First of all, we must note the essential characteristics and details of what we saw or heard, because this facilitates our recollections even after many years have passed. So, for instance, we would be able to easily recognize a man, whom we may have seen at one time, by his long, bushy, black moustache, particularly if it was dyed, and more so if it was badly dyed and had a greenish, or slightly silver, or reddish hue, because this was the thing which we noticed most. The recognition of this man would, due to that moustache, be made easy, even after many years.

Of course, we would first be able to remember his face, whereas his name we might have forgotten, although the connection of the latter with a peculiar appearance, may help us some in that respect. If, however, this man has, in addition, not an every-day name, but one, for instance, which may cause laughter, we will recall that the more easily.

If we want to recall, however, names which are common, which are not at all peculiar in themselves, or some number, we must connect them with some objects which are peculiar or attract our attention. When once in Milan I wanted to look up a patient and a friend of mine, I was given the address, 45 Via Manzoni, in the Palazzo of the Count Borromeo. The recollection of the number was facilitated by the distinguished name of Manzoni as well as by the reference to the very pop-

ular name of the owner of the house in which my friend lived. When we are giving a name or a number to the individuals with weak memory—old people—we must proceed in the same way, connecting them with familiar persons or objects, giving them as a support for the memory a few more details, as, for example, that the given person is a son-in-law, or a daughter, or a well-known person. As very effectual I should like to recommend the following method which I have tried out myself. When I hear a name or a number I stop in my thoughts for a minute or two, and then I repeat what I want to remember ten times, and in this way I strengthen my recitative memory. Then this name or number must be repeated an hour or two later, and, in the evening before retiring, once more. The next morning this is done again, and in this way it is solidly retained in the memory. A casual repetition of it some time after is to be recommended. If we want to impress something important which we intend to do, it can best be done in the same way.

If, however, we are not able to recall some event or object, we must think of something which is similar to it. We must try to reconstruct the conditions of the case, put ourselves in a similar situation, and then attempt to find some characteristic features which resemble what we saw or heard, and by such associations help freshen up our memory. If we look for a name of a person we must try to recollect the place where we have heard it, the other persons who had been present at that time, how they had used it. Recollection is greatly facilitated by the combination of events which have made on us a deep impression, be that agreeable or disagreeable. When I served as a military volunteer I was once punished by my captain for two badly sewed buttons on my blouse, the penalty being single arrest for two days, a day for each button. The darkness of the prison had, therefore, considerably strengthened my memory in regard to the necessity of sewing the buttons on better; even today, after many years, I remember this event, which illustrates the proverb, "A man becomes wise through misfortune."

Much more distinct naturally, as already mentioned, are the recollections of agreeable events; old couples remember most vividly the time of their engagement, their honeymoon, because these were the most agreeable to them. Such agreeable events a man may recall from the store of his recollections so often that they will remain vividly in memory. This may even be sometimes to his disadvantage, when it becomes necessary to forget the picture of a beloved person, for instance, of a wife dead for years, or of dead children, so as to avoid excitement and the increased blood-pressure connected therewith, and which may injure his health.

The surest means to aid recollection is just frequent recalling to memory, *frequent* repeating. We must, therefore, endeavor to present to ourselves time and again the essential features of a picture which we may have seen, or anything we may have heard. It is best to do it early in the morning, in bed as soon as we are awake and the circulation in the brain is very active. If we then, in addition, make a sketch of the picture or take some notes of what we have heard, the recollection will be made easy at any time. The taking of notes is only of value if the slip containing the name or number is often consulted; this, however, is often neglected. It is of most use when such clippings are kept together, so that when a name, for instance, is looked for, one is obliged to see all other names and addresses at the same time.

When I have to follow a lecture delivered so rapidly that I am only able to take notes of it in an unreadable hand, so that I have to spend considerable time during the days following to decipher them and properly rewrite it, I find that a lecture which is read over again in this way remains in my memory forever.

It is most important that what was seen or heard once should be recalled not a week or several days after, but right the next day, because it will then be much easier to memorize.

The most important requisite is that a distinct and well-

defined picture of what was seen or heard should be perceived and repeated. The stacking up of two or three pictures at one time, or of too many details, or of non-essential characteristics can injure the memory very badly. One should make it a general rule not to overburden himself with too many non-essential details. If we compare our brain-cortex with a blank sheet of paper, upon which we write down our recollections, it would obviously be nonsensical to scribble on it too many useless things. These can only hinder the inscription and retention of important events; at any rate, it may interfere with their clear recollection. Now it requires, however, a certain degree of intelligence to sift out the important events from the unimportant and the essential details from the unessential. The higher the intelligence of a man, the quicker and more readily will he be able to recognize the essential characteristics of a picture, to distinguish them from others, and inscribe them in his notes; either these alone, or, according to their importance, as more prominent among others, and fix them there. First of all, it is necessary to have an acute vision; one must have learned to see well and distinctly, to correctly discriminate and find in everything that which is *new* in it. Correct sight, upon which our discriminating power, our clear judgment in regard to all things depends, is the main requirement for our intelligence. Without correct sight, and also, indeed, without correct hearing, there is no memory. And because this is the basis for our entire thinking, for our learning, for our whole knowledge, consequently for all our intelligence, this latter naturally depends, in the first place, upon the *capability of our organs of sense*. To develop the latter to the greatest possible efficiency must be the main object of the school.

CHAPTER XXXIX.

THE ART OF FORGETTING AND THE CURE OF BAD HABITS.

IF we are particularly interested in forgetting a sad loss or a great misfortune, we must proceed in a manner directly opposed to the one which we have found effective for retaining memorized impressions. If I want to remember something very well I must recall it very often to memory, causing thus a strong impression, an inscription, as it were, by producing a material change in the nerve-cells of the brain-cortex. Now, if I want to forget something I have to use all possible means to prevent such an inscription being graven in. If it is already engraved, I must try in every way to have it erased. The best and safest way is to simply block the way for recollective perception, by eliminating it as perfectly as possible, which means not to think of it at all. The higher the will-power of a man is, the better will he succeed in eliminating such sad and unpleasant thoughts. The task is facilitated by avoiding also the connective association thoughts, because, as said before, the memory is promoted by them, and, therefore, prevented from forgetting. If anyone in mourning, through the death of a member of the family, removes all objects which remind him of that person, or hides them away securely, and takes them out again only after a certain length of time, when the memorizing inscription has been erased, this grief would be lessened very much. It is unfortunate, however, that our prescribed customs are entirely unphysiological and unhygienic; we must wear black clothes for a year, and avoid all pleasures, theatres, dinners, etc. This is a wonderful method for retaining mourning associations as long as possible, and keeping open a wound of the soul, with all its paralyzing effects on mind and body. We do not lack, however, means to resist such sad associative connections. We must try to outdo the latter by still stronger impulses of an opposite kind;

we must try to down such sad feelings by still stronger feelings of pleasure. And this we accomplish best by following the principle of supplanting the feeling. This is based upon the physiological phenomenon that a very strong sensory stimulating sense perception wipes out a weaker one. To illustrate: If I look into the sun I become dazzled for a time and see the picture of the sun before me, with eyes closed, and I can neither see nor read distinctly when I open my eyes. When I eat something very sweet, dates, for instance, and after them eat an orange or a sweet apple, the latter do not appear to me to be sweet at all, even probably somewhat sour. Undoubtedly something similar does exist in the emotional life. A great, heavy loss outweighs another less great, and so small troubles are not at all conspicuous in the light of our greater ones, and are easier to stand; and, then, too, a sad event may be overcome by a pleasant occurrence which follows. If we want to draw practical conclusions from the foregoing reflections we may say that a young widow should be urgently advised to marry again, because this is the best way to forget the first husband (provided she is satisfied with the second one); and a girl disappointed in love should be advised to fall in love with another young man. And if the wife lost a fur boa, the husband should quickly buy her another one, more expensive if possible. Without doubt this is the best way to help to forget!

Such a displacement of memorized pictures is very strongly influenced by the degree of sensibility and the will of the given person. The more we feel a loss, the deeper will it be graven in our memory; and the less it concerns us, the more superficial will be the cause of the memorized inscription; and the latter will fade away so much sooner, and be forgotten. Now, this sensitiveness is, to a very great extent, under the influence of the will, but the will is under the influence of the intelligence. Will and intelligence are often found entirely parallel with one another; we find with highest intelligence often associated the strongest will, and geniuses may serve as lucid examples of it.

Mentally low individuals, such as idiots or feeble-minded, have, as a rule, no will at all, or a weak one, and this is the reason why they often become criminals. Often, nay, as a rule, their sense perceptions, that means sensibility toward impulses contrived by the sensory organs, are weakened. In a number of mental diseases, sense perceptions, even pains, do not reach consciousness at all; still less soul-perceptions, and we cannot really speak of consciousness in such individuals. Just because the latter does not exist, pains cannot be felt, and, therefore, the mentally diseased often eat their own extremities, an example of which we have mentioned before. One patient, suffering from softening of the brain, amputated his hand with a knife and a metal saw. Others, again, pull their hair out, or scratch their faces; they are able to starve for days, which they can very painlessly do, because no suffering is produced in them thereby. Such a lowering of sensitiveness is shown also in many hysterics, as already mentioned. In some of the revolutionary English suffragettes, who starved for days, hysteria may probably have been a contributory factor, but, on the other hand, we should not forget that women who struggle for their ideals have the ability to unfold will-power to a degree entirely unknown to men. One may be inclined to assume that in some respects, for instance, in resistance against sexual impulses, this exceedingly great will-power is implanted in them by nature. Here, too, rigid education plays an important part, the object being to keep down or entirely destroy some impulses. Many women show great power in controlling the various impulses; they simply ignore the sexual impulse, also hunger, and do not allow them to reach the consciousness at all. This submerging of the sexual instinct into subconsciousness, and the forcible subduing of it are, as already mentioned, not rarely the cause of grave neurasthenia, and particularly of hysteria. That many women succeed in this way to guard themselves, not only against sensations of the soul, but also against bodily pain sensations, is proven by the thousands of women who become adherents of

Christian science. They simply eliminate these temptations; they ignore their pain, so that it cannot come forward and thus make a deep impression upon the nerve-cell of the cortex of the brain and become fixed and retained there, and being revived make itself felt in a disagreeable form, as the impulses generally do. The latter is, for instance, the case with the sexual instinct in men, and in many women living under normal conditions.

Education often accomplishes, in a masterly way, the restraining of such impulses in young girls, and great results are obtained in this respect, particularly in the novices of the nuns, and in their educational institutions. Of course, nature or natural predisposition must help here. In a case of predisposition, where passion is seething like a volcano, the most rigorous education would be fallacious. It is a very hard matter to restrain passions and to cure bad habits. Properly speaking, *a passion, a bad habit, is nothing else but a too good memory.* If a stimulus and the act caused by it are repeated in the same fashion frequently, day after day, sometimes hundreds of times, they will, in course of years, produce a very deep impression upon the nerve-cells. Such acts may then be accomplished without participation of consciousness, automatically so to speak. They indeed then become a habit. In this way good as well as bad acts may become a habit. The earlier in life such habits appear and the longer they are indulged in, the deeper they become impressed in memory. Bad habits may then, in course of years, become so deeply engraved that they resemble the carving of wood with a chisel. Now, as the art of forgetting consists in wiping out such impressions or making them fade away, it is evident, therefore, how difficult this task may be with old habits which are so rooted in as to become second nature. Consequently, the most rational thing is to prevent such bad or inappropriate actions from becoming a habit during childhood, and thus be retained in memory, and this is the task of a good education. It is the object of the latter to teach

good actions and habits, and have them graven in memory by continuous practice; and, on the other hand, to prevent the opposite. If these are already established, it is necessary to use all possible means to forget them. This can be accomplished by the means outlined above. Bad impressions and actions should never be allowed to become established by repetitions; and, on the other hand, all associative connections with them should be discontinued. It is obviously necessary that children of drunkards and habitual criminals be removed from pernicious environment; and they should also not visit moving-picture places where such pernicious acts are shown. It would be good, on the contrary, to use the above-mentioned principle of replacement, and by good actions, by presenting and setting good examples, to drown the bad ones and suppress them. Teaching good examples and engraving them indelibly, as with an iron pen, into the memory by continued repetitions daily for years, thus preventing the inscription of bad ones, must be considered as the fundamental object of every education. Naturally very much depends upon the individuality of the child, its hereditary disposition, its will-power and intelligence. The latter are, however, developed very little in the child, and can be appealed to only in the adult. Of course, it requires a substantial amount of will-power and considerable intelligence to obliterate confirmed habits. Very often the necessity for abstinence becomes compulsory to the inveterate smoker and drinker, and then he feels as if it were a knife at his throat. The hardest period of abstinence is at the beginning, because during this time the memory of the sparkling wine, the blue smoke of the cigar and the comfortable mood produced by them are still very vivid. Gradually, however, this feeling fades, just like the memory of a dear departed friend, and time heals the wound. In this manner the erasure on the slate of memory is accomplished.

Here, also, the avoidance of association aids in forgetting. One should avoid dinners and receptions, and pass by restaurants

where best drinks may be had. One should even shun the streets where there are any, as a punishment for not having done things in moderation in the past. And the former heavy smokers must now also eat less, so that they may not miss the after-dinner cigar too greatly, which tastes so good after a heavy meal while comfortably seated in an armchair. The more frugal meal will, moreover, also benefit their hardened arteries. Many stout people are in the habit of sleeping after meals, but in connection with the treatment for obesity they must avoid the soft armchair, because it furnishes too great a temptation to sleep.

The curing of bad habits which have their origin in our instincts, such as hunger and sexual impulses, is most probably the most difficult of all. It is peculiar that in cases where the instinct is extinguished and has ceased, memory takes its place and from force of habit demands action. In the case of old people, the sexual instinct is often extinguished, but the remembrance of the same continues and insists on its execution. Associated connections in the same field, then, awaken old memories with ease. If one has lost the appetite through illness, there is, nevertheless, a desire to eat at noon, even though no appetite is apparent, and the same thing holds true if one is invited to dinner and sits among a circle of friends. It is just the power of habit to which many people are slaves, and to which they do homage.

VII RATIONAL MENTAL WORK.

CHAPTER XL.

RATIONAL LEARNING AND STUDYING.

Tantum scimus, quantum in memoria tenemus.

—KANT.

THE main object of learning is to so impress upon us everything that we have read or heard, that we may be able at any time to recall it, and make a practical application of it. Certain principles which we have learned, fundamental truths, must be so fastened in our memory that they become second nature, as it were, and are at our disposal at any time, day or night. Such elementary truths we can acquire best by numerous repetitions, therefore by recalling it very frequently. A careful retention of what was learned is of utmost importance, because the knowledge acquired by reading and listening, or by daily experience and observation, must form the foundation for building up of all our opinions and conclusions. By learning and acquiring more every day, the border lines of our circle of mental vision naturally also become wider, and by voluntary or involuntary acquisition of new impressions, thus adding new knowledge to the old, our horizon grows. Thus man learns continuously until the end of his life; we remain pupils in the school of life until the last day of our presence on earth. We note and learn those things best which our own experience teaches us practically, but we must, however, also appropriate the knowledge and experience of others; and also that which our predecessors of hundreds of years ago have acquired, collected and bequeathed to us; thus we enrich our experience. Learning means, therefore, storing up of experiences gained by one's self and by others. To the knowledge which was gained by our forefathers, to their discoveries and inventions, we then add our own share. According to Descartes the object of learn-

ing is to enable us to form a proper opinion about everything which we may happen to meet in life.

If we want to acquire knowledge, we can only obtain it by diligent and attentive learning. Diligence and attention are, as we have already said, the main prerequisites for it. It is natural that what we want to learn we must also understand very well. The latter is, however, not absolutely necessary, because by diligence we can learn sometimes, verbatim, by heart, what we do not understand at all; but this we call grinding, and is the way children and less intelligent people learn. But such a way of learning has also the great disadvantage that it is not economical, and is a waste of time. Sometimes it is also difficult, and as it very soon causes overexertion and fatigue, it is, therefore, also not hygienic. In addition comes the bad effect, that what was acquired by grinding can only be retained for any length of time by being continually repeated. Considering, moreover, that we have to retain in our memory a good many other important things, it is of very little use and means an overburdening of our memory to retain there as useless ballast things which we do not understand, and have acquired only by grinding. Such things are plugged in by recitation, and are to be used once only, namely, during the examination for which they were prepared; after the examination is over such things are, fortunately for the pupil, very soon forgotten.

If, therefore, we want to note something well, we must first try to understand it. A great number of experiments made Menumann,¹ Ebert and Kraemer² prove that what is learned in a sensible way is least trouble. Kraemer had one group of individuals learn the history of Kohlhaas by Kleist; another group some sections from the philosophical writings of Locke, whereby it was necessary to pay attention, not only to the mean-

¹ E. Meumann, *Ökonomie und Technik des Gedächtnisses*. Leipzig, 1912.

² Dr. N. Kraemer, *Experimentelle Untersuchungen zur Erkenntnis des Lernprozesses*. Leipzig, 1912.

ing of a sentence, but also to its logical connection; and finally a third group had to learn some entirely senseless and unconnected description, such as one of an oil mill found in Pompeii. It was found that the very sensible story by Kleist was learned much more easily, greater difficulties were encountered with the discourses by Locke, but most difficult were the technical descriptions.

From the investigations by Binet and Henri³ it appears that children retain words twenty-five times quicker when the words are given to them in form of sensible sentences. We can understand these results very well after the above discussion, because a subject can stimulate our interest and, consequently, our attention only when there is some sense in it. In this instance, also, takes place a blood-flow to the brain-cortex, and an increased activity of the nerve-cells. Similarly, the desire to learn increases. Kraemer also calls attention to the disgust which he noticed in the individuals of his experiments when they were compelled to learn the senseless sentences. Moreover, desire and disgust are very important factors for the blood-circulation in the brain, as has been shown by the investigations of E. Weber. The feeling of desire caused a better blood-supply to the brain. The disposition of one who learns is therefore of the greatest importance. Learning can be earnest and successful, and the subject can be retained only when the pupil or the student feels "fresh, cheerful and free," and is not distracted by cares, anxiety or fear, for instance, of punishment to be expected. I am quite unable to understand how interest can be awakened for a dry subject "by compulsory learning." Parents and teachers should consider as their main concern the creation in the children of a cheerful disposition toward learning. It would, therefore, be best, in learning something special, to make a cursory review by reading over the whole matter and getting an idea of the subject; while doing this an effort be

³ Binet et Henri, *L'année psychologique*, i. 1895. *La mémoire des mots et des phrases.*

make to grasp the main point, the leading thought which passes through the whole subject. In this way the connection between the various parts becomes clear, and this is of greatest importance, because it requires more trouble and more work to write a good treatise on disconnected material. If there are several leading thoughts, each one must naturally be worked out separately, and this would naturally, because of more thinking required, take more time.

When we succeeded in impressing upon the mind the main points of the subject, we have laid the foundation of the building of our future work. If we have to study some special and elaborate subject which we want to use as a base for some further research, and we are not at all familiar with it, it may be recommended as practical to study first a short textbook on the subject, or even an article in a large encyclopedia in which the essentials are briefly treated. In this way we grasp easily and without trouble the main points of our thesis. As a next step it would be advisable to study a number of textbooks and special treatises in such a way that we proceed from the more comprehensive to the more voluminous, and ultimately to the largest monographs and handbooks on the subject. It is also of great advantage to read over treatises of various authors on the same subject. If we want to engage ourselves with the subject very thoroughly, we must interest ourselves also with the bordering subjects, because this would widen our views and increase our thinking ability on that special subject. From the more varied points of view we look at it, the more will we notice new sides and features, and will become familiar with them. Only by going deeply into a subject are we able to obtain great results. First of all, it is necessary to have the greatest interest in the matter; only then are we able to produce something extraordinary, reaching out above the average. When we deal with our subject day and night, as it were, always think of it and always try to discover some new feature which did not strike previous observers. Generally speaking, everyone who takes a hold of

some idea should, at least, have the will to accomplish something extraordinary. If he is animated with a distinct desire for the work, he will always accomplish the greatest possible result, according to his knowledge and ability. And should his resources desert him, his work will, nevertheless, show signs of an earnest desire, and will command for him the respect of qualified judges.

If we are concerned with something practical, it is absolutely necessary to become acquainted with it by our own initiative, because only in this way we gain the proper eye-measurement, and also the right perception of the object—as already mentioned, there can be no rational thinking without it—and only in this way can it be retained in our memory for a long time. If, on the other hand, we are concerned with some theoretical subject, we must get a vivid idea of it, because we can never understand anything if we lack the perception of it. Otherwise it results in grinding, which is practised particularly by pupils who are too lazy to think, and also incapable of so doing.

After we understand our subject well, we have to read it over again a few times to grasp it still better. It is of advantage to have the main points written down on small, handy cards. A very effective method which I can recommend is to write down from memory, what was read or learned one or two days later, and then compare it with the original text. If we find then something left out or misunderstood, things thus corrected or added will remain permanently in our memory. According to my experience memory may also be strengthened by reading what is written by different authors; hereby we find the same point confirmed and repeated, and thus interpreted from different points of view; and thus repeated, and in different words, it will remain so much better in our memory. To master a subject from all its sides, theoretical as well as practical, is the highest goal of learning.

Because we can actually learn something well when we read with interest and attention, the first step in learning and

studying something, even that which appeared to us in the beginning very uninteresting, very difficult and dry, consists in an attempt to find in it some interesting feature. This would be most easy if the knowledge is of some practical value to us. Without intending to deny the great importance of a congenital disposition, it is my opinion that an intelligent man, if he only earnestly wishes, may accomplish something, even above the average, in the most variable domains. The fundamental requirement is that he should begin to interest himself determinedly in the subject, and to incorporate everything which is connected with it. Furthermore, there should be nothing connected with it which goes directly contrary to his congenital disposition. If one does not have the slightest disposition for mathematics or for languages, for the first in particular, neither his best will nor his greatest interest can be of any practical benefit to him. Whether a real genius does not form an exception in this respect I do not dare to decide.

Only one thing seems to be certain to me, and that is, that anyone who approaches a subject with an earnest desire and greatest interest, passionately devotes himself to it, thinks of it day and night, will ultimately accomplish something great in it. He would then also be fitted to transmit what he had thus learned and acquired, in word and script, to others. This is the best material from which professors can be carved.

According to all these preliminary reflections the actual process of learning would be the following. First, we must acquaint ourselves with the subject by looking it over once or twice to find out what it actually is about, and at the same time noting the leading thought. Next we should read it over several times and get the impression of the main points; and, in my opinion, it is a good plan to at once underline the respective places, and at the end of the book indicate these with some marks, or to make a short concept, in a few words, on the upper border. Finally comes the learning by heart, by frequent recitations, five, ten, fifteen times, according to necessity.

The learning itself consists of two main phases: 1, penetrating into the subject, by repeatedly reading it over with attention; 2, learning by heart by repeated recitations. One helps the other. The first sharpens the associative memory, the second the recitative, mechanical memory. Who passes through both phases masters his subject best. For most, if not for all, children the first is the most difficult; therefore, they occupy themselves more with learning by heart without first understanding it; therefore, with grinding. Children learn this much easier than adults; often they learn very rapidly this way, but what is learned is also quickly forgotten. This is only natural, because there are no associative connections to help the memory.

CHAPTER XLI.

THE INFLUENCE OF AGE UPON THE ABILITY TO LEARN— LEARNING AS DONE BY CHILDREN AND BY THE OLD.*

A CHILD generally learns everything very easily by repetition. As a rule, it does not take any pains at all to understand what it hears; it babbles about everything, and in this way learns its mother tongue. This process is continued through the first years of life, and in this way the child acquires best the method of learning by recitation. A child retains readily what is learned that way, as, for instance, prayers, which are learned in childhood, are still remembered in old age. Entirely different is the process of learning in mature age. Already the feeling of disgust, which becomes manifest at this age, makes one unfit to learn anything in a senseless way. We see something similar also among intelligent classmates, when, for instance, many a gifted pupil may make no progress at all in mastering a language, or in studying grammar, the cause of it being that bare words have no meaning to him, and he takes no pains whatever to understand the sense of so many difficult, complex rules. At any rate, he has a hard nut to crack, and the disgust prevents him from diligent application and study. The senseless grinding goes against him, and we thus see that many a stupid grinder gets better marks in Latin and Greek than a pupil of much higher mental ability.

To learn intelligently and thus strengthen the associative memory is often a matter of impossibility in small children. With the advanced maturity of mind this improves. A child is still poor in perceptions; he must acquire these as he grows up, and the results will be correspondingly better according to his environment, his opportunities, and, in the first place, his faculties. In the same proportion his associative memory develops. According to the experiments of Bourdain on a number of pupils

in a school at Paris, memory grows slowly between the age of 8 and 21; from 14 to 20 years it is supposed to remain stationary.

According to Meumann's¹ investigations children show a uniform progress up to the 14th year of age. From the 14th until the 20th they make very great progress in sensible learning. But the best direct memory is shown between the ages of 22 and 24. After that it is at a standstill. In regard to studying in mature age, I believe that here very much depends upon the habitual practice. If one stops studying entirely after he leaves high-school or the university, and has not done anything in that line for many years, it would be very difficult for him, if after discontinuing for ten or fifteen years, he had to learn and remember something by heart again. In some occupations a continuous studying is already assumed, as, for instance, in that of a minister, who has to deliver his sermons every Sunday by heart, or in that of the physician who has to study continually the results of new investigations and new methods of treatment. Such men, accustomed to much study, have no trouble in doing so in old age. Some, or even many of these men, have no more difficulty in doing this than they had in their younger days. Ebbinghaus's ability to learn had not diminished at the age of 52. Even at a very advanced age some highly intelligent men can devote themselves very diligently to studying. Alexander von Humboldt still did so at the age of 80. At the age of 76 he published the first and second volumes of his "Kosmos," and after the age of 80 the third and fourth volumes. The same could be observed in Senator, who, when he was 70 years old, published distinguished treatises, as, for instance, one on "Polycythemia," and, in addition, other matter wherein new methods of treatment were recommended. He followed very closely all progress made, and studied diligently until he died. When I visited my deceased friend, Dr. Pavy, in London,—he was then nearly 80 years old,—I always found him engaged in diligent

¹ Meumann, *l. c.*

study. The Countess von Melzi, in Mailand, at 82 years of age, had a large library in her palace in Mailand, and I have often found her engaged in studying some very difficult philosophical books, and constantly making notes. As not every old man has hardening of the arteries, the ability to learn even at a very advanced age can be perfectly understood.

Of course, a child, with his still unwritten memorandum slate, is best fitted for taking on new impressions. According to Radosawljewitsch² children retain what they have learned, mechanically as well as intelligently, better than adults. Only very young children, below the age of 5 years, show lower retaining power. According to the investigations of the two Belgian investigators, Decroly and Degand, on the 5- and 10-year-old children of the Fröbel School in Brussels, children retain in their memory best such things as they know from their own experience. Children, as well as adults, retain better such sentences which contain some concrete, easily understood idea, and they can recall them much more easily. Short sentences are retained better than single words, because the former require less attention.

Disposition of children plays a great rôle in learning. A child is, first of all, dominated by its disposition. If it is in good spirits it learns quickly; if, however, it is not well disposed, if the weather is nice, and its playmates are tempting, it is often impossible to do anything with it. Particularly are unbalanced children, according to A. Fischer's³ investigations, susceptible to such unsteadiness.

Adults also show very little ability to learn when they are in bad humor. We have tried to show in other parts of this book that changes in the disposition are in close connection with the state of blood-circulation in the brain-cortex. A bad humor

² P. Radosawljewitsch, *Das Behalten und Vergessen bei Kindern und Erwachsenen*. Leipzig, 1907.

³ Arno Fischer, *Dispositionsschwankungen bei normalen und schwachsinnigen Kindern*. Gütersloh, 1904.

must be associated with an insufficient blood-supply, a good humor with a more profuse blood-supply. The same relation must be existing when we see often conspicuous mental accomplishments manifested in some exalted conditions, whereas in depressed melancholic conditions an undecisive and an inability to work is observed. If anyone—this is particularly applicable to children—therefore is in bad humor, he is absent-minded, and his attention must constantly be incited. If attention is wanting he cannot note anything, and is unable to retain what he has learned. Aside from that, what has been learned in such way is not worth anything; the incitement and, as its sequel, the straining of attention which very soon ceases may very easily produce a condition of fatigue which we must by all means prevent. It must be here also taken into consideration that in general, as Radosawljewitsch has shown, small children have more difficulty in learning than adults. Children proceed in a very impractical way when they study, as shown by L. Steffens's experiments, and, therefore, children should be taught in school how to learn. According to Meumann, children learn much better in school and are less absent-minded than when they learn at home. He points out the importance of formal memory exercises in school. It would, indeed, be of great advantage to make children do the most part of studying in school under the supervision of the teacher, so that the child would have sufficient time at home for recreation. All our care should be used to guard children against mental overstrain and its bad consequences upon the welfare of the body.

CHAPTER XLII.

RATIONAL METHOD OF LECTURING AND INSTRUCTING.

JUST as the main object of studying is to acquire useful knowledge and retain it in memory, so the main object of instruction is to so impress into the memory of the hearers the subject being studied that it will always remain there. To that end it is, in the first place, necessary to create in the audience an interest for the subject. This may be accomplished (*a*) by the subject of the lecture itself; (*b*) by the manner of delivery. Interesting as the subject of the lecture may be, if it is delivered in a monotonous, unvaried way, it will neither attract attention nor create interest, as we see well in schools and public meetings. First of all, the lecturer himself must be warmed up to the subject; otherwise he will not succeed in warming up the audience with it. Of course, often a speaker undertakes—as we see frequently in political meetings—to grow enthusiastic for his subject only externally without having the fire deep-seated. This is a false ardor, which an attentive and intelligent listener would very easily detect; consequently his interest will become extinguished, and he will retain nothing of the lecture; probably not to his disadvantage! If one preaches water from the pulpit, and in his inner heart favors more the wine, his lecture would lack the inner conviction, without which he would never be able to convince others of the truthfulness of what he speaks.

The essential prerequisite for creating in the audience an enthusiasm for the subject is that the lecturer himself should be inspired with it, and, in the first place, that it should have been thoroughly mastered. If this is lacking the lecture will lose a great deal in coherence, clearness and form. The listener can only follow the lecture quickly when from the start a leading thought passes through it like a red thread, indicating that the lecturer has grasped his subject correctly, and can unfold it in

a continuous logical connection. It would then also not be necessary to read off the lecture, which is—as may often be seen in scientific meetings—very tiresome, particularly if it is a long one and read in a monotonous way, and, therefore, cannot engage the attention as well as a lecture delivered with enthusiasm.

If a lecturer masters his subject perfectly, he is, as a rule, able, unless it is concerned with technical details, to deliver it extempore with the simplest words and in the shortest possible time. And, according to my observations, such plain and directly delivered lectures have the most intense effect upon the audience. They are quickly understood, well noted, and retained very well by the memory. Instead of listening to a read-off lecture, one may just as well read it in a journal, and may often retain it better. Catholic pulpit speakers have often a great reputation for being able speakers and preachers, which is doubtless due to the fact that they never read their sermons, as the Protestant ministers in England sometimes do.

If a lecturer possesses the above-named qualifications he might be able to present in a very interesting manner even an otherwise very tedious theme. It is of greatest importance, if he is to succeed, that he intertwine into such a subject something which is interesting, even if it has only some indirect relation to it. Some lecturers, distinguished by their intelligence and combination ability, have the faculty of presenting even a very dry subject in such an interesting manner that the hearers hang on their words, as it were. I have often admired it in Professor L., in Paris, who lectures on histology. By introducing some interesting topic of a general importance, and by a perfectly formed beautiful delivery, he is able to present the subject, which has so little attraction to the layman, in such an inspiring and interesting way that it is a real enjoyment to listen to him. The genius of the great anatomist Hyrtl also manifested itself in the way he well understood of making the subject of anatomy attractive in his textbook (which passed

through so many editions) by inserting interesting details for comparison, and everywhere pointing out the practical side and emphasizing this in particular. In just this way a capable teacher is most likely to create in his pupils a *desire to work* and *pleasure in study*. *To stimulate this is the best key to success in all instruction*. I consider it possible to stimulate interest in pupils even for the most dry subject, if it is shown to them that it leads to tangible practical results. This is of the greatest importance in instructing children, because children, and most particularly not very gifted children, are, in general, egotistic and show interest for something only when they are able to see some practical gain. A child can be won generally for concrete and practical subjects, whereas theoretical ones leave it cold, and this often holds good with older pupils, with high-school pupils, and with university students. It is only possible to get them interested in a subject if it is possible to give practical demonstrations of it. Pictures can be best retained in our memory of such subjects which we have ourselves seen, touched, felt, heard, smelled—which we have, therefore, perceived with our sense-organs. Of such subjects we get the best impressions, and can preserve them well. If anything cannot be directly seen, however, and can be presented only theoretically, we must make a picture of it for ourselves and preserve it, relying entirely upon the lecture of the teacher and the aid of our perceptive ability according to our faculties. That such pictures must often turn out bad, and are also not retained well, is obvious, because learning from such instruction does not amount to much. When I was a pupil in the Piaristen Gymnasium in Nagy-Kanizsa, in Hungary, I could best follow those lessons in chemistry and physics which were presented in the laboratory of the school with the aid of experiments. Up to the present day I remember many of them, but the number of stamens in plants, the number of vertebræ in many animals I had forgotten the next day after I recited them in examination. That a child instantly forgets such dry details, and similarly also the dates

of historical events which have no importance, is an established fact, and hence the question arises whether it is necessary to torture the children (high-school boys and girls included) with them. The foremost law in rational instruction must be that the children should master the subject to be learned with greatest ease; they must learn *economically*, and thus spare their health; and, by all means, avoid mental fatigue and overexertion. To let the children learn something by great effort, or by grinding, knowing that it will be very soon forgotten, is senseless. Therefore, at least during the years before puberty, before the mind is mature, in all teaching particular stress should be laid upon the practical side, and upon everything which can stimulate and hold the child's interest. In describing plants, therefore, their practical use should be pointed out, rather than the number of stamens. A child would, for instance, very easily remember in regard to saffron, that it has a yellow color, and that it is used as a spice and if added to rice would give it a yellow color. In zoölogy the children should be taught the mode of living and the habits of the animals, but not the tiresome anatomical details which they will anyhow soon forget. In geography it should not be attempted to plug in the names of the mountain-peaks, plateaus, rivers, and their courses in China and Japan, but rather describe the remarkable costumes of the people. The interest in regard to Morocco would be surely increased if the children were to know that the nicest dates come from there and from Tunis. In regard to cities, their productions and industries, their eventful history should be told; then the pupils will, by association, remember also the purely geographical details better.

In teaching the history of the world, which should be described with particular care, considering the fact that it is nothing else but an enormous collection of practical experience and of good and bad examples in the development of mankind, the most interesting episodes should be related, because these are best retained. There should be described some striking

event from the private life of particularly great historical personalities, such as incidents from the life of Henry IV, and particularly from the life of great discoverers and inventors, to whom mankind owes much and who made their countries great.

Such characteristics are retained by children in their memory better than the tiresome dates of the years of political and commercial conditions, and it also offers the best opportunity to present to them some shining examples that they may be stimulated to emulate. In this sense, I consider the teaching of the world's history of greatest importance for the future of mankind, and for the education of citizens devoted to their country.

In teaching the dead languages as well as mathematics, the congenital predisposition of the pupils should be considered. Those who are predisposed to both of these would form exceptions. According to my observations two groups of pupils may be distinguished: (1) those who have a predisposition for mathematics, and at the same time are often deficient in the languages; (2) those who learn languages easily, but are no good for mathematics. And, still, mathematics is the science which helps us to acquire a good eye-measurement and develop logical thinking. This is the reason why we find that the great philosophers have also been excellent mathematicians, as, for example, Leibnitz, Kant, Newton, etc. Ability to tell proportional measurements may also be of great benefit in other branches, such as music, drawing, painting. With a predisposition for mathematics there generally goes hand-in-hand a congenital faculty for chemistry, physics, and the natural sciences. According to my experience, in pupils with just such faculties can be easily found a direct aversion toward something which they do not understand. They can only impress upon their minds things which they can perceive. In such pupils judgment is better developed than imagination, and those who show preference for foreign languages, foreign nations, world's history, literature, and reading descriptions of voyages, have greater

imaginations. If, however, imagination and well as good, sound judgment are found combined, then we have to deal with ingenious children, with a predisposition for great talents, for a genius. Unfortunately, however, this predisposition is often killed in its origin by our school methods which, like a mill, level and equalize all our faculties.

It is possible to direct imagination as well as judgment into their proper channels by making the subjects presented intuitive, —if possible shown life-like. It would, therefore, be very desirable if we had a school museum in every town, where most of the animals, plants, and minerals could be exhibited in nature or in picture, in their own environment in their life habitat. Of similar value are presentation of events from the world's history, pictures of great men, inventors, discoverers; also pictures of foreign lands and foreign cities. Whole classes could in such a locality assemble several times a week, and in combination with a lecture there could also be visits to picture galleries and art museums, in order to gain practical knowledge in world's history. Such lectures will be followed by the pupils with the greatest curiosity and interest, and will probably be retained by them until their old age. The main purpose of schools in general is to prepare for life, to develop natural predispositions, to accumulate knowledge and experience acquired during youth, to load the pupils' brains only with such subjects which may directly or indirectly be of use to them in their future life; but not with useless trash, which will anyhow be soon forgotten, the learning of which is not only tormenting, but also overstrains and tires out the brain. For that reason common generalizations, tabulated knowledge, classification in many subdivisions, etc., should be avoided as much as possible; it is, really, as the Vienna saying goes, "Only for the cat," and after having been ground in with trouble it is soon forgotten.

If the teacher presents some very dry subject he can, by interweaving some interesting examples from other domains, again revive the attention of the pupils who probably may begin

to fall asleep from weariness. Kant, for example, was in the habit of relating in his lectures incidents from the world's history and from natural science, thus making his lectures so entertaining that his hearers followed him with pleasure.

It is of advantage for the purpose and success of teaching that the lecturer be able to exercise an influence upon his hearers by his personality, and to awaken in them a fancy and joyfulness for studying even dry subjects. A sympathetic relation between the lecturer and his audience is the best means of creating the good spirit for study which is absolutely needed for mental work. The lecturer must also study the expressions of the audience with his eyes, and notice at once any falling off in interest, or the beginning of a tired feeling; and these should be signs for him to interject interesting examples from his own experience about the practical application of the subject under presentation. This, of course, requires that the lecturer should be well read; and it would be laudable if all learned men had no "eye-flaps" on, as it were, which induce them to anxiously avoid everything lying beyond the limits of their domain. In private intercourse, as well as in teaching, such dryness, with everything hopelessly gray, never awakens any sympathy; and it certainly cannot create the indispensable class interrelations between the teacher and his pupils. What is the use of all the great scholarship of a university professor, who grew up in a laboratory in seclusion from the world, if he is not able to impart something of his extensive knowledge to his pupils, and if he remain to them an unapproachable idol?

When Kant lectured his eyes continuously wandered over the audience. He was fixing now one, then another, and took note of everything in the behavior and expression of his hearers; in particular he studied the impression which his lecture produced upon his pupils, and whether or not they understood him well. He watched his hearers so sharply that he missed nothing, and when he noticed something offensive on their clothing or discovered a missing button, it was one of his

peculiarities and weaknesses to get so mad about it that it even disturbed his lecture.

Such a vivid interest in the hearers may have well existed in the good old school at Königsberg, but in our present fully packed university lecture-rooms it is no more possible. It would be, in the interest of successful teaching, very desirable that the members in the class of one teacher should be so limited in number that he could be able to keep an eye constantly on each individual pupil, and notice whether or not he were paying strict attention to the subject.

Instruction by practical demonstration, securing at the same time the greatest attentiveness, could be best accomplished by the use of the kinematograph. If the pupils could see passing by, in all veracity, strange towns, nations, and their costumes, foreign animals in their natural habitats, their curiosity would be excited to the highest degree; their attention would be attracted, and whatever was learned would probably be retained forever.

As a member of the Flemish Society of Naturalists and Physicians I witnessed in Lowen a kinematographic lecture by Professor Van Gehuchten about spastic paraplegic spinal paralysis with such interesting pictures that I can easily understand how such pictures can be particularly well retained in the memory. The object of teaching in all schools would undoubtedly be very much promoted by the aid of kinematographic lectures. If, however, the schools should be supplied with museums and kinematographs, and the teachers, these most important officers of the State, should receive a salary corresponding with their high and noble calling, it would cost the State several millions, and it is to be feared that they would be frightened by such an expense. One museum for all institutions of a town, of a not very great size, would be sufficient, but each school should have its own kinematograph. Even if the sum of money required should be ever so large, it seems to me that hardly any other expenditure would bring to the State so rich an

interest as this. The most elementary insight must tell us that no other sum spent is so good an investment, as the one which is used for public education. Nothing can make more secure the future of the State, down to the remotest times, than the rational mental education of the growing-up generations. The future of a State need not depend upon the great size of the population, nor upon its wealth, but only, and above all, upon the intelligence of its people. That a small State can gain great riches, might, and distinction through the high intelligence of its citizens, we may learn from the history of Holland, England, and Prussia. And the history of the present time also teaches us in plain language that not the number and bravery of the soldiers is the deciding factor in warfare, but the intelligence of the leaders and their charges. If, therefore, a State desires to secure for itself a great, powerful position among nations, and a great future, it must use all its means—even if it should be the last cent—to elevate the intelligence of its population. Only a well brought up child may become an intelligent citizen, an intelligent soldier, an intelligent general!

CHAPTER XLIII.

A FEW WORDS ABOUT RATIONAL WRITING OF TEXT-BOOKS AND SCIENTIFIC TREATISES.

WHAT has been said about verbal delivery is also applicable to a written textbook. It is, first of all, necessary that it should be easily understood, and written in a bright, attractive manner. Only in this way can the interest of the reader be awakened, his attention held, the matter easily absorbed and remembered. To stimulate the attention of children and their desire to learn I consider it of great advantage to have inserted in the textbooks beautiful, colored illustrations, such, for instance, as are to be found in Dr. von Haustein's Zoölogy. First of all, it should be written in a clear, perspicuous style, because if it becomes necessary to read a sentence over two or three times in order to get the meaning, the reader becomes disgusted, and, as I have mentioned before, mental work is arrested. From the investigations of E. Weber, and others, it is evident that the feeling of disgust affects the blood-circulation in the brain-cortex. I can see no reason why scientific books cannot be written in such a way that it would be a real pleasure to read them. Too many great scholars think that their writings can have more claim to be scientific if they are written in a heavy, involved, overornate style, with long sentences, and selected expressions not easy to understand. They call it scientific when it is so written that only a small circle of selected students can understand it. I am still of the opinion that even treatises of the highest scientific order would not lose in value if written in a more popular style, with short sentences (not eight or ten lines long), employing the lightest and simplest expressions in plain and unaffected language.

German scientific works are read very much by people not of the German tongue, and the greatest difficulty is experienced

when, as is usually the case with those not familiar with the language, they first have to search painfully for the noun in the middle of the sentence, and then search again a long time for the verb. And when the noun and the verb are at such a distance from each other as Karlsruhe is from Danzig, it is no small wonder that such a mental work is, for others than Germans, very tiresome.

Mark Twain very truthfully describes this in his book, "A Tramp Abroad," which is filled with American humor. Undoubtedly, such heavy, difficult, highly scientific style may some time drive to despair even a German-born—or, at any rate, tire him out prematurely if he has to read each sentence three or four times before he understands it. The spoken as well as the written presentation, which means the textbook, should indeed satisfy the main requirement of instruction, namely, it should be understood by the pupil or reader without any further trouble without the necessity of wasting energy and time. By all means avoid tiring and mentally overstraining the pupil and reader of the book. It is to be particularly regretted that even textbooks for the instruction of children too often trespass in this respect. Instead of being written in a comprehensive, easily understood way, and in as short a form as possible, using only familiar expressions, I found, for example, in a grammar for 11-year-old girls, in the first grade of a gymnasium, the following: "The superlative is a word which signifies that a characteristic is a peculiarity of a subject in the highest degree." It is obvious from this how necessary it is to prevent, by every available means, such elaborations, because this leads to the grinding down of those sentences which the child has difficulty in understanding. In cases of this kind I consider grinding (plugging) as given to man by nature for the defense against threatening injuries to the mind. If the little girl had taken pains to understand the sentence mentioned, and if, besides other subjects, she had to learn only one page every day of such nice things intelligently, it would undoubtedly result

in a tiring out of the mind and mental overstrain. Fortunately, children, instinctively, often have more sense than adults, and instead of working hard for hours trying to understand such incomprehensible things, they grind them down with less pains and with less loss of time. In writing a textbook, as well as any scientific treatise, the guiding principle should be to stimulate a pleasant disposition to learn, by using an attractive style and avoiding unnecessary dryness, thereby saving the reader time and trouble. Here, again, is shown the truth of the expression: "*Le style c'est l'homme.*"

CHAPTER XLIV.

THE RATIONAL STUDYING OF FOREIGN LANGUAGES.

EVERYBODY speaks best and most thoroughly his mother tongue; in this language the most difficult expressions and rarest words come most easily to the mind. This language is also learned with the greatest ease in play, as it were, from childhood up. It is fortunate that a child cannot understand grammar. If a small child had to begin to study grammar as soon as it could form the necessary first ideas, as it is done entirely unphysiologically and in a stupid way with growing children and adults, it would surely kill any linguistic affection right in its beginning.

Considering the fact that a child acquires a foreign language with playing ease, it would be well if in learning a foreign language one would go about it in the same way as the child does.

As soon as a child becomes a few months old, in his brain-cortex accumulate pictures of various—entirely new to him—curious objects. A child is inquisitive by nature—to the great fortune of mankind—and it wants to become informed about everything it sees or hears, or all it smells or touches. Names for these various things with which the child comes in contact every day are given to him; it hears how these objects are distinctly designated, or it itself applies names to them which very often resemble the noise which the objects may happen to produce, or the sensation which they may cause; they become onomatopoeitic, as it is said. We also find words formed in such a way in the languages of uncivilized nations whose intelligence is in a state similar to that of a child. So, for instance, the spear in the Maoris has the name “wiwirri,” reminding one of the noise which the spear produces cutting through the air when it is thrown. The words “strike” and

“clap” are designated by “pitata,” and a strong rain is designated as “pitapitata,” whereby surely the pattering sound of the rain is imitated. But we also find something similar in the modern languages. So, for instance, in German the words: sausen, hauchen, klingeln; in Hungarian the words: csörgö, zörgö (tschörgö, sörgö = rattle), bömböl = it drones (the cannon); in Turkish tschatlamak = clap; bülbül = nightingale; the Italian word bimbo = child; fischiare = whistle; in Dutch babbelen = talk. Particularly in old Egyptian were used such words as “iô” for mule; “krúr” for frog.

Closely resembling the child's way of thinking is the origin of the word “angor” for wine in Malayan. Java formerly belonged to Portugal, and when the Portuguese entertained at their homes travelling Frenchmen or those from the French colonies in India, they offered them wine, and in filling the glasses again would generally say “encore” as an encouragement to drink. This was taken notice of by the Malayan servants, and as the vine does not grow in their country, and, therefore, no word exists for it in their language, they gave the strange drink the name “angor.” A child would surely proceed in the same way, and as our daily observation teaches us, they actually proceed in a similar manner.

Only in the child, which very often resembles a small monkey, the imitation impulse is very much developed. A child spontaneously, by instinct, repeats words and names, and it therefore easily notices all the names which it hears. Before a child is ever able to pronounce a certain word, because his organs of speech are still undeveloped, he already understands what is meant by it. In the child we consequently observe something similar to what we see when adults learn a language. He understands the language well, but cannot speak it; for it is generally easier to understand something than to find the proper words and pronounce them.

The words which a child learns are all names of objects which surround it; it learns, therefore, mainly words which

designate concrete objects. The stock of words may not be great, but it is sufficient for its needs.

To instruct older children and adults in a language very quickly, it would be well to follow the example set by the children. First, we must acquire a stock of words. There are peasants who possess a stock of not more than 300 to 400 words, and they get along well with them. A foreign language is mostly learned for the purpose of making one's self understood while travelling in foreign lands, or to understand foreigners who live among us. Philosophical discussions are on such occasions required just as little as are abstract perceptions. It suffices when we acquire in our stock of words what is needed for everyday use, and, in general, 300 to 400 words would be all we may need. In studying a foreign language I would suggest that the first lesson consist of thirty or forty words, mainly nouns with their prepositions. In the second lesson just as many verbs in first and third person of the present tense singular, and probably the second person in the plural, together with their proper nouns. In the third lesson the adjectives, not separated, but in connection with various words of the same gender. In the fourth lesson thirty to forty adverbs; in the fifth lesson numerals up to 100; in the sixth lesson the past and future of thirty verbs; in the seventh lesson and in those following, sentences should be formed with the aid of the words already learned, whereby about twenty-five new words may be learned in addition. It is very important that in each succeeding lesson the previous one should be recapitulated. It is possible thus to acquire a vocabulary of 300 or 400 most useful words with considerable ease in ten days.

In the first place, words that are not needed in daily life should not be learned. I consider it wrong when I find in the second and third lessons in grammars for the use of children such words as "tree-trunk" and "kitchen-cabinet." It must be started always with what is needed, and only when this is acquired may we pass on to what is less needed, and then to words which

designate abstract or rare conceptions. As a means to promote the memorizing of words 300 of the most common words of a foreign language could be put together by using letters made from colored paper. It is easy to get a colored alphabet, and this should be used for assembling the words. This method is best used in instruction in the classrooms, and these words could be suspended on the blackboard, because in this way two sense-organs are affected at the same time, and thus memory is strengthened by association. It might be sufficient if only fifty of the most important and, at the same time, most difficult words are prepared of such colored letters. Memory is still more helped if each word is made up of several colors. So, for instance, the vocals in the main colors—red, blue, yellow, green; the consonants in their shadings. The genders could also be designated by putting a golden rim around the first letter of a masculine word and a silver rim when the word is feminine, whereas the absence of a rim would signify neither one of the two, but neuter. I know from my own experience that the colors of an object are remembered even a long time after other details have disappeared from the memory. This method, which I propose, of using colors in studying languages, could also be used for other studies; for instance, for learning chronological numbers, whereby the main colors could be used for the even numbers and the shaded gradations for the uneven numbers.

The colors would probably attract greater attention to the subject from the children, and thereby make the work pleasanter. The interest would also be more awakened by learning useful words, and not the monotonous colorless grammar, and it will also, according to the law mentioned, strengthen the memory. I think it is the studying of the dry grammar in the beginning which kills the pleasure of learning foreign languages. And of what use is the knowledge of the most beautiful grammatical rules, if one does not possess a stock of words? I consider it more logical to acquire the words first, and then the proper grammatical form in which to put them. Of course, in

that case one would speak a faulty language, but the main object is that, after a few weeks of study, one should be in a position to make one's self understood in a foreign land; whereas, the grammar grinders may know the language excellently after several years of study, but they cannot *speak* it. In other words, they *know* the language, but cannot *master* it.

In the way suggested I have learned enough in four weeks to speak Persian. I know twenty languages, and in twelve of them I have already delivered lectures; only two languages have I learned by studying grammar from the beginning, and these are Latin and Greek—and just these two I cannot speak. French I have also learned grammatically in school, but after a year's study I was not able to speak even what was absolutely necessary. Later on I learned privately 500 words, used every opportunity to speak French, even though it was ever so bad, and in two months I knew more than previously after a year's study. My procedure in learning foreign languages was always to *acquire a stock of words*, then study *grammar*, and then *read much*. In reading, however, I did not look up each individual word in the dictionary—this took away my patience and pleasure when I was a child, and then, like other boys, I was done with study—but when I approximately understood the meaning of the sentence, I analyzed the word myself; constructed its meaning from the connection with the other words, and, as a rule, I succeeded without difficulties in understanding the whole thing.

In teaching a child a foreign language it is necessary to create in him a desire for it, to excite his curiosity, to show him the benefit of it. If in teaching a child one begins with grammar instead of winding up with it, the studying is done for. The German child does not learn his German from the grammar, but learns the latter only when he is already able to talk. Why, then, should we act so illogically—in studying foreign languages—by having the child learn first the dead form and the living context later?

When we have accumulated a stock of words, then it is very useful to compile a few of the most used sentences in conversation, about the weather, meals, etc. These will, of course, turn out faulty without the knowledge of grammar, but the main thing, however, is to be able to make one's self understood, and it gives great pleasure, particularly to children, when they are able to say the first time, "Good morning" in French, or are able to ask for anything in a foreign language. In this way children get a desire to learn, and this is indeed the main point when you want to attain something. When the desire to learn languages is awakened in children, and they already know by heart a sufficient number of words, we can begin teaching grammar. The style of language in which the grammatical rules are written or presented must be very plain and not so difficult to understand as most of the textbooks are, as the example given in chapter vii, 4, shows. Attention, and in consequence of it, ability to take notice may be increased in children and in adults by presenting examples in which the usefulness of a given rule for daily use is demonstrated. Only four or five examples should precede every given rule, and not follow it, as is the case in all our textbooks. First examples should be given, and then the rule. In most instances four or five such examples containing words useful for every day should be written on the board, and the rule should be deducted from them. According to my conception, the word "rule" means the establishment of something characteristic and distinguishing, which is common to the various examples and a generalization of it for all cases in which it would serve as a guide.

I consider it directly unphysiological when, in the grammars, first the rules are given, then the examples. The children become weary during the presentation of the dry rules, and the same is often the case with adults as well, and if the rule is not correctly understood, where is the benefit of the beautiful examples? It is an overstraining of the child's brain which should, by all means, be avoided! Besides the grammar, the child has

to study other subjects, and from all the other subjects which it studies, the learning of the dry rules present to the child's brain the most and greatest difficulties, unless it grinds them like a parrot without understanding them.

To hold the attention of the children it would be appropriate to have the examples put on the screen of a projection apparatus, and the words designated in the rule under consideration should be given in colors. When conjugations are presented, the present, past and future could be presented in main colors and the others in the various shadings. A phonograph giving the right pronunciation, correct intonation, and accentuation, could also be used with great advantage. The correct pronunciation is the most important thing in learning a foreign language. One may have studied a language for many years, and may master it in word and script; may speak it grammatically, but what good does all this do him if, due to a faulty pronunciation, nobody understands him? And it is remarkable also that a false intonation or a false accentuation of a word is sufficient to make it misunderstandable, even though it be applied ever so correctly. An English lady, who once sat next me at a table d'hôte in a place near the French-Spanish border, after each course always asked the waiter for mercy by wrong pronunciation of the word (mercy instead of mercie). A phonogram must naturally be taken from some one who has a perfect pronunciation, preferably from one born in the respective country. The phonograph has also the great advantage that it can be used for self-instruction. Of course, the instruction in a living language by a native is of still greater advantage. Due, however, to the fact that this is not always possible, it is absolutely necessary that the State should, at its own expense, send young teachers abroad that they may learn the correct pronunciation. It is not right that some one, who does not have a perfect pronunciation, instruct others in a language which can only be understood when the pronunciation is correct. Even if the expense to the State should be too great, it must be taken into

consideration that a knowledge of languages is of the utmost importance for the development of the intelligence of its citizens. Only thus prepared are they in a position to travel in foreign lands, to proficiently enrich their knowledge, to establish commercial connections, to export products of the country, and thus to increase the wealth of their State. The mental production imported from foreign countries fertilizes our own, and produce much better effect in the original than in translations. The knowledge of foreign languages facilitates also the acquisition of the researches, discoveries, and inventions of distinguished men of foreign countries for the benefit of our own. How happy do I feel that I can read the publications of foreign investigators in the original languages! For research in the domain of natural science and medicine, the knowledge of at least French and English seems to me indispensable. But how many important publications appear also in Hungarian, Dutch and Scandinavian, in Italian, and even in Spanish, which it would be worth while to read *in extenso*! But in literature, also, it is fascinating to read in the original the works of Thackeray, Sir Walter Scott, Victor Hugo, Cervantes, Camoens, Esaias Tegner, Ibsen, etc. In the translation the fresh dew is removed and the aroma of the precious fruit is lost.

The knowledge of foreign languages is a first-class means of developing the intelligence. We have already designated travelling as a practical exercise for the sensory organs, whereby many new and various things are perceived, and our senses are sharpened. Such *direct perceptions* in foreign countries can be made possible only with the knowledge of the language of the respective country. Foreign languages serve us also in widening our mental horizon, and particularly enable us to grasp new ideas. The knowledge of foreign mental productions stimulates particularly our own productive power, a fact which we can observe every day in the domain of inventions and discoveries. How right was Karl the Great when he said: "*Quot linguas calleo, tot homines valeo.*"

It must be considered as the sacred duty of the Board of Education of every State to promote, by all means, knowledge of foreign languages, and to shun no expense to accomplish it. Every cent spent to instruct teachers practically in foreign languages abroad would repay a million times by its benefit to the public wealth.

CHAPTER XLV.

HINTS ABOUT COMPOSITION OF THE FOOD IN STRENUOUS MENTAL WORK.

ANYONE who works must nourish himself well, and this should correspond with the quantity of work done and with the amount of strain used. Similarly to any other kind of a machine, the human body can perform work only when fuel is supplied, or when it receives nourishment. By feeding we produce heat in the body, and this, being the main source of energy, may be transformed into labor, either bodily or mental. Also during mental work a consumption of material, a consumption of tissue takes place, and that has to be replaced.

During strenuous activity of the central nervous system more phosphorus and lecithin are consumed, and both can be replaced only by nourishment. The blood-supply to the brain is increased, as is required by the thinking process, and, as has already been mentioned, a sufficient blood-supply to the brain can only be produced by a generally sufficient supply of albumin and by sufficient nourishment. It, therefore, becomes necessary that men doing strenuous mental work should eat well and substantially. This, however, does by no means lead to the conclusion that a too abundant nourishment is good for them. An overloading of the digestive organs is even very disturbing for mental work, particularly when the food is difficult to digest. In that case an overactivity of the digestive organs takes place, causing an increased fullness of blood in these organs, and this quantity of blood is taken away from other parts of the body, and, therefore, the supply of blood to the cortex is lessened. This manifests itself ultimately by a heavy feeling, a lack of desire to work, and sleepiness after a rich meal, when, in addition, the food taken in is difficult to digest. Mental workers should eat only easily digested food, otherwise they lose several

hours a day for work. It must also be taken into consideration that strenuous mental workers, as a rule, take very little physical exercise, and this also makes a perfect digestion unlikely. The prime principle must be for such men to partake of very little food which contains too much connective tissue and cellulose. White meat, such as young chicken, veal, and lamb, would be better; but the most easily digested albuminous food is, however, a soft-boiled egg. Ham is also easy to digest, but only if prepared in Prager style.

A very digestible food, hardly felt in the stomach, is fish, with the exception of eel and salmon. Some varieties of fish are of great advantage, in that they supply much phosphorus. We, for reasons already stated, must partake daily of at least 50 grams of albumin. Food for mental workers must also be rich in carbohydrates. These can be supplied very readily in the form of macaroni, farina, and rice; also tapioca, sago, etc. This albuminous and carbohydrate food, containing very little waste, has, however, a disadvantage in that it leads to constipation, and this we must avoid by all means, because it induces fermentation of toxic substances (Plönnies),¹ which, as before mentioned, injures our intellectual faculties, particularly the memory. We must, therefore, add waste-containing foodstuffs, because the waste acts as a stimulant for the evacuation of the bowels. It can be best accomplished by using bread prepared from the whole rye,² particularly as in the old country mills; such bread having also the great advantage that it contains important minerals, such as calcium, phosphorus, iron in much large quantities than white bread, which is very poor in such substances. Very important nutritive salts are also supplied through vegetables, but those containing cellulose in large quantities must be eliminated. These can be taken in the form of purée.

¹ W. Plönnies, *Deutsche Zeitschrift für Nervenkrankheiten*, Bd. xxxv, Seite 74.

² Lorand, *Rational Diet*, etc., Chapter: Concerning Bread, and the Advantages of Brown Bread over White Bread.

Fruits also constitute a food rich in nutritive salts, and some of them, like May cherries, grapes, etc., are easy to digest. Some fruits, such as nuts and almonds, are very rich in albumin and fat, but mainly in phosphorus and calcium. They contain inositolphosphoric acid, which plays a similar rôle in plants as lecithin does in the animal body, but they have, however, the disadvantage of being difficult to digest, and, therefore, the important mineral substances cannot be well assimilated from them. The latter disadvantage can be remedied, however, by fine grinding. Butter is a food which contains lecithin and easily digestible fats. Of all fats this is the most desirable for the stomach and the intestines; beef fat and mutton fat remain very long in the stomach undigested, and, therefore, mental workers should avoid dishes prepared with these. Particularly so if one is inclined to insomnia, because such food, when taken in the evening, lies in the stomach until early morning hours, and may disturb sleep the same as do foodstuffs which puff up. Vegetables rich in cellulose, particularly pod-fruits, must therefore not be eaten in the evening by nervous individuals suffering from insomnia. They may be directly injurious to those suffering from arteriosclerosis by causing gas accumulations. Otherwise pod-fruits constitute a very profitable nourishment, because they contain very much phosphorus, calcium, albumin, and carbohydrates. They are best taken in a purée form. Some of them, such as the soy bean, in the hygienic form of flour, may be made into biscuits. Eggs, milk, and cheese can be recommended as food richly supplied with phosphorus and lecithin. Cheese, when scraped fine, in form of powder, is also easy to digest. Vegetable food that is rich in phosphorus has the disadvantage that the phosphorus is not well assimilated, and the greatest part of it is removed from the body through the bowel. On the other hand, the phosphorus incorporated in animal food appears in the urine, which indicates that it has been absorbed and utilized. In certain animal organs, such as the liver, sweetbread, and also in the brain, phosphorus and

calcium are contained very richly, but the greatest part of it is very difficult to digest, and is badly utilized. Brains are best prepared in the form of purée. If a tendency to uric acid formation exists, these dishes should be prohibited.

In regard to the times set for meals, the main principle to be followed should be that work should be done neither on an empty stomach nor on a full one. Our meager breakfast and working thereafter until noon, in Berlin even until 2 o'clock, is highly unhygienic. Equally bad is the large dinner at 12 or 1 o'clock, as is customary in Austria and in Germany, because, due to the full stomach, mental work is then hindered for several hours in succession; and it may also be observed that children in schools are sleepy during the first hours after meals. One should take a more copious breakfast, take lunch at noon, as is done in England and America, and then dine in the evening. I would propose for mental workers the following menu as appropriate:—

Breakfast: milk or coffee with milk, 2 eggs, oatmeal (well cooked) with cream and sugar, butter, fruit (cherries, oranges).

Lunch at noon: fish, potatoes or macaroni, rice, fruit cake (light pudding).

Evening dinner: soup, roast of white meat, potatoes, macaroni, rice, or green vegetables, dessert—pudding, fruit.

The quantity and composition of the food must vary according to the character of the mental work. For those with creative mental activity, where much imagination is required to create new ideas, inventions, discoveries, I consider, for reasons given in my previous treatise,³ phosphorus and meat foods most appropriate. There is hardly any doubt that the richly meat-eating English and Americans belong to the most intelligent people in the world, and that most inventors and discoverers may be found among them. At any rate, I would consider a diet which is poor in albumin and phosphorus as not an appro-

³ Lorand, Rational Diet, etc., Chapter: On the Influence of Food upon the Nervous System and upon the Attributes of Mind.

priate one for creative mental activity, because in that case the blood-supply in general, and thus the supply of blood in the brain, is affected. *With strictly vegetable diet it is never possible to supply the blood with such quantities of albumin, phosphorus, calcium, and iron as with mixed diet.* A strictly vegetarian diet is more or less an underfeeding. On the other hand, daily experience teaches us how excellently a rather more copious feeding acts in a weakened condition of the nerves. Of course, for profitable mental work it should not be too copious. Whereas, a luxurious diet, by increasing the blood-supply to the brain, acts more beneficially upon imagination. The scanty, ascetic diet of a Diogenes acts, on the other hand, more favorably upon the gifts of criticism. In the case of studying and learning the wisdom of others, or of cold, temperate judgment, or of thinking about philosophical problems, or of more mechanical mental work where nothing productive is required, it is possible to get along with vegetarian diet, but only with the addition of milk and cheese. Applying this to the domain of music, I would consider the first kind of diet more appropriate for composers, and the vegetarian diet better for the plain musicians of an orchestra who only play melodies composed by others.

CHAPTER XLVI.

RATIONAL FOOD FOR MUSICIANS.¹

IN practising music two kinds of work are executed: (*a*) physical; (*b*) mental. The physical work is, with some instruments, not at all easy—for instance, in playing the piano; playing the violin also requires considerable muscular strain, and even singing demands a good deal of work by the muscles of the chest, and somewhat also of the abdominal muscles. Considering the fact that muscular activity, as is well known, is done at the expense of the sugar stored up in the muscles—the glycogen, and that this is derived from the sugar taken into the body with the food in form of the carbohydrates, rice, potatoes, cakes, etc., it is obvious that a greater or lesser amount of these food materials must be introduced into the body, depending on the amount of work to be done. The nourishment of a person playing extensively the piano or violin must contain a great quantity of rice, potatoes, and cakes; but, on the other hand, it must also contain a sufficient quantity of albumin, because the movements of the muscles increase their blood-supply, and thereby tissue, consisting mainly of albumin, is deposited, and such muscle becomes larger and stronger. We thus see ardent piano-players, even delicate girls, who sometimes have such strong arms and hands, which are entirely out of proportion with the other muscles and extremities of their delicate body. Such persons must, therefore, introduce into their bodies albumin (meat) in sufficient or even greater quantity. The most important component parts of the blood, the blood-corpuscles, indeed, consist of albumin, and when the quantity of the latter is not sufficient, blood-corpuscles cannot be formed. These blood-corpuscles protect us against infectious diseases by the fact that the white blood-corpuscles destroy the bacteria entering into our bodies, to which we are

¹ Appeared also in "Der Musiksalon," published by Lubowsky in Berlin.

exposed throughout all our life. This explains how a growing young girl, who plays the piano very much and eats very little meat or eggs, could very easily acquire tuberculosis, particularly so if she is predisposed to it through her parents or grandparents. But such a diet, poor in meat, in eggs or in milk, has still another disadvantage, and that is that it introduces into the body too little phosphorus. A phosphorus containing nourishment is particularly important for the strenuous mental work of the composers with creative activity. A strictly vegetarian diet can surely not be recommended for such individuals, for the reason that the necessary amount of albumin and phosphorus cannot be obtained from such food. Even if some of the vegetable food-stuffs, like pod-fruits, contain very much albumin and phosphorus, much of it is lost through the bowel, and cannot be utilized by the body. For a composer it would be rather of advantage to have a more copious diet with sufficient meat, fish, eggs, milk, cheese, and with rice, potatoes, cakes, etc. If the individual is more advanced in age, then more moderation in eating should be recommended to prevent the development of arteriosclerosis, which is particularly liable to occur in strenuous mental activity. A short time ago I met a lady, who was a very able pianist and composer; she looked like a man, played like a man, but she also ate like a man!

A strictly vegetarian diet should, then, not be recommended for women piano-players, particularly in the period of growth, but the food should, nevertheless, contain a sufficient quantity of green vegetables and fruit, because this prevents constipation. The latter occurs very often in women, and in young girls, due to certain peculiarities of their bodies, which I have fully described in my book on "Old Age Deferred." The bad habit of some ladies of drinking no water, or very little of it, may easily lead to constipation. They omit it for fear of becoming too fat, but surely nobody gets fat from drinking much water. The only effect is that the food is utilized more easily, but a substantial increase of the body weight can hardly ever, or very

seldom, be attributed to this alone. Abstaining from water is anyhow a very bad habit, because it may also prevent the elimination from the body of various poisonous and injurious substances, such as uric acid. Such substances are thus partly eliminated through the skin, and such persons get pimples on the face. By the proper selection of the food we can best preserve and improve the beauty and complexion, as I have shown in the above-mentioned book, and at the same time still be able to prevent becoming fat. Individuals acting on the stage seem exposed to this danger, particularly many women singers are inclined to it. Often the most beautiful soprano and tenor voices are found in persons inclined to obesity. To successfully combat this sugar-containing foodstuffs, cakes, rice, and potatoes must be restricted. Mountain climbing, sweat-baths, treatment with laxative mineral waters, hot brine baths may act very well and explain the popularity of the cures in Carlsbad, Marienbad, and Kissingen. If obesity, however, is due not to too copious nourishment, but to a congenital disposition, then a careful treatment with thyroid may be useful.

VIII. RATIONAL DEVELOPMENT OF INTELLIGENCE IN CHILDREN

CHAPTER XLVII.

HINTS ABOUT MENTAL EDUCATION OF CHILDREN—THE HARM OF PUNISHMENT.

RATIONAL training of animals can only be accomplished with kindness and much patience. The animal trainer Bostock, who died a few years ago, used to say that for a successful training of animals two things are required:—

- (a) great love for the animals;
- (b) unlimited patience.

That much more can be accomplished with animals by kindness than by punishment was taught by the old Hagenbeck.¹ Formerly, animals used to be urged to learn by cruel treatment, by making them timid with the firestick and hard whips, and the result was that, although the instructors were often torn to pieces, the animals did not get much smarter. Hagenbeck has shown that with a piece of sugar and a mild, friendly treatment even wild animals may be made tame and friendly.

Now there is a correspondence between animals and men, not only in many anatomical and physiological features, but also in regard to training, taming and education. This we see very distinctly in the treatment of the mentally diseased. Not much more than a hundred years ago the insane were kept in chains, and were heavily punished, as if they were unmanageable criminals and not unfortunate patients. The result was that their condition grew worse. Today such patients are treated with kindness. If one visits an insane asylum today, it seems as if visiting a rest retreat. In the rooms where formerly, due to

¹ Karl Hagenbeck, *Von Tieren und Menschen*. Berlin, 1912.

cruel treatment, noise and roaring dominated, it is now very quiet, and as a result of human and expert treatment strait jackets belong to the things of the past. Chambers with blue light and protracted baths have taken the place of the latter, and one can wander through the wards of insane asylums without hearing a loud cry. What a difference, in comparison with the barbaric and ignorant treatment practised by our forefathers!

If, then, a kind and humane method in the training of wild animals and in caring for and treating unmanageable and maniacal human beings has rendered such excellent results, it may be assumed *à priori*, that this method of old Hagenbeck would also be beneficial when applied to the training of the human young, whose mind has not as yet reached its maturity. I am inclined to think that, as a rule, the promise of reward would much sooner induce a child to diligent work than the threatening of a good thrashing. Frederick Hebbel was the child of a mason, and grew up in the country. The maid Susanne, daughter of a country school-teacher, who took pains in educating him, had very peculiar methods of instruction; she held in the one hand a ruler and in the other one a bag of raisins. While whipping is indeed a very much felt argument, it is not always convincing, but it may create in the heart of the child a number of *negative*, bad, and dangerous feelings, such as bitterness, hatred, revenge, and sadness, which have, heretofore, probably been entirely unknown to him. Worst of all, however, is the fear of repeated punishment, as there becomes implanted in the most delicate mind of the child the most disagreeable and most injurious feelings which oppress the human mind, such as fear, anxiety, grief and care, and these do not leave him until he dies. An education for future life should do everything to keep off feelings that destroy human mind and body or should kill them in their beginning. Kindness and reasoning would be the best way to accomplish this, even if it is sometimes very difficult. Love for the children and unlimited patience with them are the surest means for successful educational

results. *Whoever whips his child, strikes himself!* Children should be brought up in such a way that a word of censure would be felt more deeply than any bodily punishment. If we have to deal with children who are bad on account of congenital predisposition, then no punishment will be of any avail, and all that can be done is to treat this morbid predisposition in an appropriate way. Just such mentally backward children are very revengeful, and it is pointed out by Wagner von Jaueregg² that cretinous children never forget any injustice done to them. According to Binswanger, punishment of the feeble-minded has only the bad result of making them worse. Just as little as it is justifiable to hit an insane person is it justifiable to strike a feeble-minded person as a punishment for his shortcomings. The latter should be administered to the parents who treat the sick child in that way.

There is, consequently, very little sense in compulsion. By words of encouragement, and eventually by promise of reward, a normal child may be made to learn most easily; and in case the child is abnormal a stick will not help much, and may do harm. It is, generally speaking, a pity that life carries with it that *compulsion* which is the mother of ill-feelings embracing the man from his childhood up until he dies. I trust that the method of education in coming centuries will make use of love and kindness, and that compulsion, threatening, fear-creating, all these compulsory measures, which breed neurasthenia, hysteria, and mental derangements even during childhood, will be forgotten. That neurasthenia and hysteria may be induced by anxiety and fright, particularly where there is a congenital predisposition, I have already mentioned. Very many children are, however, still more frightened and punished by their parents at present than wild animals by their trainers. We constantly carry on our lips the motto: "Everything for the child," but, unfortunately, only on our lips and not in the heart.

² Wagner v. Jaueregg in Lewandowsky's Handbuch der Psychiatrie, Berlin, 1912, Monographie über Kretinismus,

Why do not we in Austria-Hungary, and in Germany also, found a society like the English "National Society for the Prevention of Cruelty to Children," which has its agents everywhere? They inspect the homes of the poorer population—the homes of the rich should also not be spared—and bring to notice all cases in which children are ill treated. The State sees to it that the peasant should treat his horses and his foal well. Why does not a similar commission go around a couple of times during the year and see how the peasant treats his children, and in what condition they are? It is true that in some States school physicians watch over the physical welfare of the children, but they often know very little of what is going on in the parents' homes, behind the scenery. Hungary was, probably, the first State to have school physicians introduced, about twenty years ago, under Secretary Trefort. Hungary was also, by the way, one of the first States which clearly declared that every illegitimate child has a right to be brought up and educated by the State. The education of such children in the pitiful cottages of their foster parents living in misery, often, unfortunately, leads to physical and mental debility. What a favorable opportunity presents itself here for the State to interfere and bring up able men who will serve it, instead of later having to spend millions for the support of these individuals in hospitals, insane asylums and prisons! I am very sorry that the State too often thinks of correcting the past, but not of prevention for the future. It spends a million of our tax money where, with some foresight, it could get along with one-one-hundredth part of it. And all this is just the reason why the present generation thinks it cannot get along in education without compulsory means. But it is possible to obtain the best results in education and instruction without the use of the slightest compulsion, as I have seen in the school in Mailand, conducted after the Montessori method. The best of all methods for education of children I consider to be the creation of a desire to work. If a child does something with pleasure, it learns best and quickest. This is accomplished

in a very ingenious way by the method of Dr. Maria Montessori in Rome, of which we have already spoken. The children learn during play and become so deeply absorbed with the learning—which also resembles the playing—that they neglect the playing proper. The children only want to learn and not to play, because the learning, such as selecting various beautiful colors, building of towers, whereby they receive practical instruction in measuring, gives them more fun than dull play. I noticed there that a beautiful 6-year-old child, with curly hair and dark-blue eyes, was the only one who remained inactive. The teacher let her alone, as she did not want to use any compulsion. Half an hour later, however, when the child saw that everybody else was working, the imitative instinct, inborn in children, got hold of her, and she also began to work. Reading and writing are also taught by that method. The children are given the figures of letters in their hand and are told that this is the letter A or B, or some other letter, and the child must then pick out a similar letter in colors and put it on top of the first one; and the child is generally joyful when it has done it correctly. By telling it then to search for C or D, and by numberless repetitions, it is reminded of the name, and thus remembers the letters well. After the child has found the colored letters and put them on those corresponding it is helped to draw the contours with a pencil. Hereby it is taught to hold the pencil like a pen in writing, so that it actually writes the letters. Next it is given an alphabet of sandpaper in the hand and, blindfolded, is made to feel and recognize the letters. It happens very often that, after a short time, a child will go to the blackboard and write down the various letters entirely freehand. I think that this is the quickest method of teaching the children to read and to write.

I would like to emphasize particularly that the children are at work with body and soul, and pay their full attention to it. They even do not allow themselves to be distracted by the singing and playing of the other children, and often neglect to

play during the recess. In a similar way, also, are numbers and figuring taught, in which case, to attract the attention of the children, entirely new coins are used for figuring. The greatest advantage of this method is that as the children have to see everything distinctly they have to touch and feel it; therefore their power of observation is sharpened, as well as the senses in general, without which, as already mentioned, rational thinking is impossible. The most striking feature is that the teachers do not exercise the slightest compulsion. No sharp reproving, or threatening words, or gestures are ever used. On the contrary, the children are rather flattered instead of whipped, and everything goes well with kindness. I have only noticed diligently working children, and if there were exceptions, these were mentally backward children. It is thus entirely different from what is otherwise so often observed in regard to education, even in the homes of the parents. Some parents, in their ignorance, whip the children for every little thing; sometimes even when they happen to be themselves in a bad humor and the children, in their inborn curiosity, put a curious question to them about the different things which may have excited their attention. Now it is just this feature which the parents should greet with pleasure as the first sign of awakened intelligence. The great philosopher Locke said plainly: "Encourage inquisitiveness in the child as much as possible, answer his questions and instruct him how to form his own opinion."³ By all means, endeavor so to train the child that he may be able to form a correct opinion about every subject. The child should be shown all kinds of things and their significance, and the name given. Then should be taken a number of objects which are very similar, but not entirely alike, and the child asked to point out the difference. I consider it a very good thing to let them describe the individual objects. Hereby the child could be taught practically to express himself correctly, and, above all, to see aright and gain experience. I would then recommend the placing of five or six

³ Locke, *Some Thoughts on Education*. London, 1692.

objects beside one another, and ask the child to designate that feature which is common to all of them. What all have in common is their *essential* characteristic; therefore, one of their *main qualities*, and to recognize this is of greatest importance for thinking and for judgment. Thus the child learns to find some common features in various objects, to gain, therefore, some abstract ideas. I have already mentioned that children have great difficulty in distinguishing essential things from unessential. It becomes, therefore, necessary to help them to learn this practically, and also keep watch that they should, first of all, get the correct idea of everything. It would be wrong, however, to offer them the right opinion at once; it should be, rather, left to them to form their own ideas, because this acts as a powerful stimulation to think, and help should be offered them only when it is noticed that they are on the wrong track. Such help and correcting they remember then for a long time. *Self-correction* in children I consider of utmost importance. As an example I may mention again the little Dutch girl of whom I spoke before. When I asked the child, "What is a butcher?" and she answered me, "He is a man who has a white apron on," I asked her whether "A child's nurse, who also wears a white apron, is a butcher?" the child corrected herself, and said that "A butcher is a man who kills animals." By pointing out such mistakes, made either through inexperience or through being lazy toward thinking, such mistakes may be avoided, and at the same time the child may be stimulated to think and to widen his practical knowledge without causing him very much trouble. It would be very appropriate if the parents or the teachers in the elementary schools would introduce such reflecting hours (*Begriffsstunden*) once or twice a week, whereby one hour could be devoted to explanation of various occupations, and another to the consideration of subjects such as hygiene and the proper care of the body. In the hours devoted to the study of religion, history, geography, there is a good opportunity to make conceivable to children such abstract conceptions as human friendship, patriotism, steadfast-

ness in misfortune, etc. Such ideas as are liable to promote qualities of the soul could be best implanted during the instruction in religion. Whatever may be the ideas about religion of a grown-up person, that is his own concern; but it is absolutely necessary to teach religion to children, so as to offer them an inner moral support. How could a State exist at all if its citizens would be kept from misdeeds only through fear of punishment by higher authorities, but not by the voice of their own consciences? The child should be inoculated with the belief that there is a higher power who sees everything, even the most hidden things, and also that all bad deeds become ultimately punished. The conceptions of humanitarianism and altruism are best and easiest taught through religion. Of course, a child, who is mentally of a low grade, would be kept from bad acts only by fear of punishment, but an intelligent child would be influenced by comprehending the meanness of bad acts, and without the fear for punishment, sooner or later. Such a moral support, the altruism, could be best taught the children practically by arranging that they should have to care for the comfort of others. This is done by the Montessori method, whereby every morning one of the children, in turn, has to examine the others to know whether they have clean ears, clean teeth, and clean hands, and take them to the wash-basin if anything is found not right. One child must watch that the others should be orderly dressed and make a good appearance in general. This gives also very effective instruction in personal hygiene, and because it is just children who are so susceptible to all kinds of infectious diseases, in particular to inflammation in the throat, to diphtheria, these diseases are liable to be more easily prevented in that way. That alcohol, immoderation in eating, uncleanliness are very injurious could be practically demonstrated with kinematographic pictures. The preparation for practical life could be accomplished best by forming their ideas under the guidance of wise parents and teachers, and prevention of false and injurious conclusions, considering the fact that up to the time of puberty

children can only do concrete thinking. It is probably not so much needed for intelligent children, but much more so for feeble-minded and dull children.

Excursions in the country with the teacher are of the greatest advantage. It gives an opportunity for presenting to the continually inquisitively asking children full chapters on natural history; for instance, about the life habit of insects which are injurious to agriculture, and about others, again, as the stag-beetle, which are useful. Explanations can also be given to them of the utility of many singing birds, and here the opportunity may be taken of appealing to them for the protection of these birds, as a practical lesson in altruism; how necessary it is to respect the life of all living creatures, except they do damage to ourselves or to plants which are helping to support us. By showing them how the plants which grow in the shade are not so well developed offers the best opportunity to give the children practical instruction in hygiene and develop in them love for light and sunshine. By teaching them that plants are just as much living beings as man and animals, they are taught to respect also their life and not tear them out by the roots uselessly and destructively. When, moreover, the child gets into the habit of sparing the lives of animals and plants, it will continue this habit when it grows up, and will spare the life and health of its fellow-men in body as well as in soul; and will do them no harm, neither by words nor by acts. Such instructions will consequently prove to be an *important step to the perfecting of the growing generations of mankind*, and the best means for the prevention of crime. For that reason the country homes which give such practical instructions in nature, such as have been introduced particularly by Lietz in Germany and Dr. Reddy in England, are to be wished the best success from the bottom of the heart. Young people in general should spend all of their spare time in God's nature, hindered as little as possible by home work. Strolling about in the country, over field and in the woods can develop the senses much better than sitting around in

the bad air of overfilled classrooms, and, therefore, the general introduction of the English scout associations and of the pathfinders, which have already done much good, can be most warmly commended.

Development of practical conceptions and teaching of correct sight and observation, indispensable requisites for correct thinking, can also be very much promoted by the modelling of various objects—if possible from memory—in clay or plastolin. Drawing of the objects is also of great advantage, because it sharpens the observation; and it also offers an opportunity to find out whether the child has at all the faculty to observe. In the Montessori method children of 5 or 6 years are given drawings of objects, which they have to fill out with various colors. In modelling with clay, and in the selection of colors, it can be found out whether we have to deal with an intelligent child or with a stupid one. The latter will paint a cow blue or green, and from this conclusions may be drawn. In the education of the stupid children particularly the Montessori method acts grandly, because it engages the attention which is lacking in such children, but it is also good for intelligent children, because it is based upon a continuous correct observation, and, first of all, sharpens that. And the ability of correct observation is the surest foundation for the development of great mental faculties and talents.

A great advantage of this method also is that it does not put any strain on the child, that he learns with pleasure, and this is the safest protection against mental overexertion. This is particularly to be valued in the education of stupid children, because overexertion of such may act very fatally.

CHAPTER XLVIII.

BAD AND DULL PUPILS—CAUSES OF DULLNESS AND ITS TREATMENT.

DARWIN writes of a monkey trainer who was willing to pay a double price for monkeys if he could borrow them for a few days before purchasing them. He then observed how they behaved during instruction. If he noticed that the monkey would watch every insect which happened to fly by during instruction, he would refuse to buy, but when it would stick to his business, he concluded that he could use it. This proved that the monkey trainer was an excellent pedagogue. With children it is exactly the same; as soon as a child becomes absent-minded during instruction and pays no attention, it is not able to perceive anything, it cannot note anything, and, therefore, can learn nothing. If this happens not only temporarily, but the inattention remains permanent, he will make a bad pupil. Two groups of such children may be distinguished:

(1) Those in whom the will to learn is absent:

(2) Those who lack the ability to learn, due to conditions which are not under the control of their will, and are the result of congenital predisposition. When the inability is based upon a congenital morbid predisposition, for instance, congenital feeble-mindedness, there is also often present a weakness of the will, so that inability is also accompanied by unwillingness. It then naturally becomes difficult to apply the will to being attentive, and unreasonable parents may whip their children ever so much, and they may be punished in school for not studying, it may lead to the manifestation of all kinds of bad qualities, but in regard to scholarship, surely, nothing will be gained. It would be more sensible to act upon the congenital inattentiveness and inability to learn in a salutary, pedagogic way. Often the true character of such children is not recognized at all, and

what is actually a morbid condition is considered as an ill-will. Sometimes an idiotic child is not recognized at first sight, and the same may happen with a feeble-minded and dull child, for the congenital narrow-mindedness and dullness frequently remain unnoticed by the teacher, unless the intelligence is examined by an expert,—a subject which will be treated in a later chapter. Very often the recognition of dullness in a child is made difficult, and its presence is veiled by the fact that even feeble-minded children and idiots show faculties above the average in some subjects, and especially such subjects which depend upon an excellent mechanical memory. Witzel,¹ in Warsaw, described a case of a Jewish girl from Poland, who became idiotic after typhoid fever, and showed an extraordinary talent for multiplication. She was able to multiply in her mind two two-digit numbers in a few seconds, sometimes even immediately. She had her own method for doing it, but this was also only a mechanical one. Subtraction and addition she did badly. Heller mentions a case of a mentally low-grade idiot boy, who, in mentioning a date, was also able to immediately add the corresponding day of the week, and with perfect positiveness, at that. He was a living calendar, and was able, besides that, to name the bill-of-fare for years back. He was, however, unable to do any summing up, even the simplest kind. This boy also had the faculty of rumination, which may be observed sometimes in idiotic children. The food which he swallowed he was able to belch up again in small balls, and, like a ruminant, chew it over again. Some years ago Witzmann demonstrated in the Society of Neurology and Psychiatry such a feeble-minded calendar artist, who was able to give all the past and future dates of the years between 1000 and 2000. Not rarely, feeble-minded and dull children show also a particular musical memory, as well as great musical faculties in general. Not long ago I saw a 6-year-old boy from Berlin who betrayed great musical

¹ Adam Witzel, *Archiv für Psychiatrie und Nervenkrankheiten*, 1904, xxxviii, S. 122.

faculties, but in speaking he stammered, and was so dull and stupid that if, on coming home and wishing, as was his habit, to put his own coat on the bed, he found something else already lying there, he would stand helpless with the coat on his arm waiting until somebody would take it away from him. A little 6-month-old brother showed in the face a typical myxedematous look.

If a child is dull and shows no attention for learning and instruction, as a rule, some morbid conditions are to blame. Some months ago I visited the Children's Home (Casa dei Bambini) of the humanitarian society in Mailand, where the children are instructed according to the Montessori method by exercising the senses and by manual training. I found there all the children very diligently working excepting two of them; one of these, a 4½-year-old child, with a large head (not hydrocephalus) and puffed-up red face, was standing inactive and looking around absent-mindedly and showing not the slightest interest. When I inquired of the teacher about the origin of the boy she told me that his father was an alcoholic and his mother had heart disease. Moreover, this child was of an angry disposition, and easily became furious and then violent toward his comrades. This is a very instructive example of the development of a criminal disposition in children of alcoholics. During my visits at educational institutions I was able frequently to observe that in the cases where a child was always lazy and dull, there were deficiencies either in the predisposition or in the environment. They were either offspring of parents suffering from some cachectic diseases such as tuberculosis in particular, or from alcoholics and syphilitics. Particularly often they were anemic, and badly nourished children. There is hardly any doubt that underfeeding may be the reason why the children learn badly and are dull. We will take up the subject of rational feeding of school-children in the next chapter.

The reason why alcohol, syphilis and tuberculosis may so often be the cause of feeble-mindedness, narrow-mindedness and

dullness we have already considered repeatedly. These conditions injure the thyroid gland and other ductless glands of the newborn, which have the greatest influence upon mental development. In such children are often found adenoid vegetations which obstruct respiration, and thus injure also the blood and oxygen supply of the central nervous system. The above-mentioned diseases injure the thyroid glands of the parents, and this condition is then inherited by the children, as already mentioned, and as was pointed out in particular by the investigator of the thyroid, Hertoghe.²

Hertoghe has shown that children of parents suffering from chronic benign hypothyroidismus, therefore from a weakness of the thyroid, remain backward in their studies. Orthography is very difficult for them, and they are not able to express themselves properly. Hertoghe says about them: "Leur language est rudimentaire et ils sont malaises à l'instruire." He also mentions that such children, even when they are already well grown up, "Ont une peine infinie à se loger dans la tête les notions les plus élémentaires de l'orthographe. Il leur est aussi impossible d'avoir une orthographe correcte que d'avoir les pieds chauds: l'organisation cérébrale est incomplète." Hertoghe goes even so far as to assume that if a grown-up person with a careful education should nevertheless find spelling difficult, we are justified in suspecting a weakness of the thyroid gland as the cause of it. Such individuals are very poor in arithmetic. Of course, the bad school record of such children may also be caused by the weakness of the sense-organs, which is quite often present in such conditions. In association with adenoid vegetations occur catarrhal conditions in the ear with defective hearing in one or both ears. Also through nearsightedness the pupils are often prevented from advancing with the rest of the pupils. It is, therefore, the duty of the school physician to examine all the children carefully in the direction indicated, and report the

² Hertoghe, *Der chronische gutartige Hypothyroidismus*. Lehmann, München, 1899.

results to the teachers. Often dullness is presumed, where it is really a case of nearsightedness or bad hearing.

If we want to improve the dullness of the children, we must, therefore, act upon the cause underlying it. The most important causes are, as already mentioned, weakness and faulty development of these ductless glands, which dominate the mental faculties, and of which the thyroid and the sexual glands are the most important. In many of those children which are entirely unable to learn, a substantial improvement may be obtained by treatment with thyroid. They become more attentive and retain better what they have learned, as I have noticed in many children. It is of great importance to begin with the treatment very early and not to wait until the age of puberty is reached. Such a treatment may be of great benefit, not only in cretinous children, but, as numerous experiments by Hertoghe³ have shown, also in cases of simple thyroid weakness.

Hand-in-hand with this organotherapeutics must go also a corresponding mental education. What characterizes a dull child is that it is able to form ideas only with difficulty. It is not able to distinguish between essential things and unessential, nor to see which features are common to all objects. It has, therefore, difficulties in establishing the differences between objects. The store of its thoughts and conceptions is not great. The feeble-minded child is a real materialist. Only what he can touch and feel is of value to him; he is only interested in the external appearance of things; he is entirely lacking in sensing that which lies hidden behind. Ideal conceptions are for him something above the skies, and far from his understanding. We observe the same, more or less, in the dull pupil. His circle of vision is narrow and limited. Only what he knows from experience and from sight enters his mind. The perception of something unknown is much more difficult for him, because he is poor in perceptions, and has difficulty in forming ideas. The only and surest way for his mental education is practical dem-

³ Hertoghe, *l. c.*

onstration. For that reason all that has been mentioned in the foregoing chapter may be applied in a still higher degree to the dull children. By the Montessori method we are able to facilitate learning in normal children, and thus prevent their mental overstrain; and it is also the easiest way for educating dull children, because everything is taught by practical demonstration, by seeing, feeling, touching. Particularly in the dull is it of greatest importance to exercise the senses, because here weakness of the sensory organs and their faulty development is most frequently found. Therefore, this method, which teaches correct sight and, based upon it, correct judgment, is the best for dull children. Here it is of the greatest importance that mental overexertion should be avoided. The more so in such children, because it may lead to very bad consequences—the mental condition may get worse, and much more so, however, in the feeble-minded children.

Strohmayer⁴ mentions a case in which, through overexertion in a course of private instruction, the condition became so aggravated that the child had forgotten how to speak, to stand or to walk. Heller,⁵ Strohmayer, and others have observed in overstrained, low-grade children, as the result of overexertion, the appearance of moral defects, for instance, stealing, which at the same time was done in an entirely senseless way, as they stole things that were of no use to them whatever.

The instruction by play and demonstration has also the great advantage that it does not permit any monotony. The latter, in particular, is liable to cause feelings of disgust and, following on it, mental overstrain. During play it is also of great advantage to model objects of clay or plastolin as a preliminary step to manual instruction. The faculties of children may be best found out from their inclinations to various kinds of play. I have seen in the school à la Montessori that the most

⁴ Vorlesungen über die Psychopathologie des Kindesalters, S. 166, quoted after Heller.

⁵ Heller, Grundriss der Heilpädagogik, S. 210, Leipzig, 1912.

intelligent children select plays in which various colors and marks are to be recognized, while the dull and unintelligent are more interested in plays connected with manual labor, such, for instance, as putting in plugs in corresponding holes. By recognizing these different kinds of inclinations and their variations, and by promoting them, it is possible to make of such children useful members of society. Some of them are indeed endowed with great faculties in certain domains, such as music, languages, and arithmetic. If, then, to such one-sided gifts there is added great diligence, I consider it possible that such dull, unintelligent children may progress very far, and even become distinguished scientists. With their one-sided faculty and much diligence such individuals may be able to work out special problems into their minutest details, and even publish books and scientific treatises of value. Of course, in their publications we would search in vain for some original idea, and everywhere there would be noted signs of a mechanical and technical gift, and a lacking of any kind of originality.

CHAPTER XLIX.

DILIGENCE, LAZINESS, AND ABSENT-MINDEDNESS—TREATMENT OF LAZINESS AND ABSENT-MINDEDNESS.

ANYONE visiting the wards in insane asylums would notice that many of the patients, particularly the depressed, melancholic, and high-grade idiots, are sitting around entirely useless and inactive, or are walking around in the garden in an aimless manner, just as may be observed in a dog whose large brain has been removed. Also in the modern insane asylums, where provision is made for the patients to engage in some occupation, such patients want to do absolutely nothing but lie around lazily all day.

In great contrast with these are another kind of patients, mainly such who present a state of more or less maniacal exaltation, although not of the highest grade. Whereas these patients, at other times, could not be induced to do any kind of work and in their state of melancholia waste their whole day sitting in one position, they are now very animated and therefore ready to do any kind of work, or if no work can be found for them at the institution, they are continuously occupied with some kind of art corresponding to their faculties, and, strangely enough, under the influence of the exaltation, they sometimes do things in which they have formerly shown no ability whatever. During my visit to the insane asylum at Nizza I observed a case where a patient was continually doing caligraphic work, and drew the nicest girls' heads with the pen. He manifested such great artistic talent that he could have become renowned in it outside of the asylum, and still he was nothing more than a very plain laborer. He was as diligent as if he was paid for it. Similar cases are mentioned by Lombroso.¹ Some of his

¹ Lombroso, *L'homme de Genie*, III Partie, S. 318, IV Aufl. Paris, 1909.

patients had such an impulse for artistic activity that they covered the walls, the tables, and even the floors with paintings. One of these patients was, before the outbreak of his insanity, a mediocre painter, and it was actually remarkable how this patient became more perfected during or, as Lombroso said, on account of his disease. One day during one of his attacks that patient made a copy of the Madonna of Raphael which was awarded the first prize at an exhibition.

Very remarkable, also, is the case of the painter Magnoni, from Reggio, who suffered from dementia and delusion of greatness. For fourteen years in succession he had no desire to work. He was then encouraged by Dr. Zani to do some work again, and in response he again took hold of the palette and covered the walls of the asylum with very wonderful paintings. One of these paintings represented the starving Count Ugolin with his children, and it was so magnificently executed and so true to nature that one insane woman in the asylum threw pieces of meat at the painted Ugolin, so that he and his children should not starve. The grease-spots left by the meat on the painting could be seen for a long time after.²

A very instructive instance of the influence of attacks of mania upon the increase of the faculties and the development of diligence, I may even say, of a morbid diligence, is the case of a very plain mason who, as related by Lombroso, became a painter while in the insane asylum at Pesaro. He made very clever caricatures of the employés of the institution, condemning them, in picture, to the most terrible punishment. When it happened one day that the cook, a jovial looking stout man with full cheeks, denied him a favorite dish, he made a painting representing the cook in the position of "Ecce Homo" before a fence, which prevented the starving from getting hold of a great abundance of tasteful and tempting dishes displayed on the other side of the fence.

² Gazzetta del Manicomio di Reggio, 1876, quoted after Lombroso.

I want to emphasize, again, that these "attacks" of diligence have been caused by the attacks of mania. We have repeatedly mentioned that in the state of exaltation, in all probability, much more blood is supplied to the brain than usual; in the state of melancholic depression again we expect a weaker supply of arterial blood to the brain-cortex. And now we see here the contrast between diligence, on the one hand, and laziness and lack of desire to do any kind of work, on the other. Moreover, we can observe daily, under normal conditions, that, when the brain-cortex receives a greater supply of blood, energy and desire to work are increased.

After partaking of coffee or tea, particularly if it is a strong infusion, most people feel stimulated to work. Indeed, many people can go to work after a plentiful meal only after they have taken their black coffee. The reason that after the use of coffee or tea the blood-vessels of the brain become dilated and the brain-cortex becomes better supplied with blood is the best explanation. On the other hand, we know, however, that after a rich meal disturbances of the general circulation take place, because great quantities of blood rush to the digestive organs, whose functions are greatly increased. So much less of the blood, consequently, reaches the brain and, therefore, the blood-supply to the brain-cortex is diminished, and this causes sleepiness after meals; and there is then, naturally, no desire to work. Moreover, we see always an undesire for mental and physical work manifested when the blood-circulation in the brain-cortex is made difficult. We see this very often in anemic and chlorotic girls, who manifest signs of fatigue, not only of the body, but also of the mind. Something similar we also see in convalescence after grave diseases associated with fever. Diseases of the body, particularly those associated with great pain, have a very bad effect upon the desire to work, and make work impossible, on account of the fact that all attention is turned to the bodily ailments. The concentration of attention on one definite subject is thus prevented, and any kind of mental work is ren-

dered difficult, and, as a rule, made entirely impossible. As soon as attention is lacking absent-mindedness is noticeable. Such a condition we find very often in many mental diseases. The insane and most of the feeble-minded and imbeciles are unable to give their attention to one definite subject, but again and again deviate from it. We observe the same in some neuroses, in neurasthenia, and hysteria. On the other hand, we sometimes observe absent-mindedness in very intelligent individuals, even in geniuses. In the latter instances, the cause is not the inability to concentrate attention upon one subject; on the contrary, they possess this ability in the highest degree, but the attention is directed only to the one subject in which they are particularly interested, or to one problem which they wish to solve. The latter thus monopolizes their whole attention, so to speak; they think day and night only of that one subject, and thus it happens that they pay no attention whatever to the occurrences of everyday life, which, of course, appear to them as unessential. Such individuals are so absent-minded that they ignore everything else besides that one question which occupies their mind. For instance, they may search for hours for their eyeglasses and find them attached to the nose; or attempt to pay in a restaurant three times for the meal which they have already paid for. The great mathematician Ampère was so absent-minded that he once, to the amusement of his students, used the blackboard rag, instead of his handkerchief, to blow his nose in. What was he thinking about at that time? I may mention here, also, the great forgetfulness which characterized such men as Kant, Rousseau, Faraday, etc. Kant was, as a child, so forgetful that while he was playing in the street he would leave his school-books somewhere, forget them, and then receive his punishment in school for it. Rousseau complains in his "Confession" that he could not remember anything and must write everything down. In the insane, who are indeed not far from geniuses, similar things are often found.

Fundamentally different from the just-mentioned absent-

mindfulness is that weakness of memory which we find in imbeciles and the feeble-minded. Whereas, in the great minds mentioned above it was due to the greatest strain of the will to work and concentrate all their attention on one single subject with the elimination and ignoring of all others, the feeble-minded lack altogether the will and ability to concentrate the attention upon any one subject. Feeble-minded children we frequently recognize by their absent-mindedness. The latter is also a conspicuous feature in some processes connected with the functions of the sexual glands. So it is manifest in some physiological processes of the latter, particularly in child nursing; also in gynecological affections, such as difficulties of menstruation, irregularities during puberty, and in the climacteric. Similarly also in total sexual abstinence; old maids, for instance, often walk in the streets, so deeply engaged in thought, that they notice nobody. Most frequently, however, absent-mindedness occurs in masturbating men, as well as women. As an example of absent-mindedness occurring during puberty, I would like to mention here the case of a young girl from Berlin, who is now 14 years of age. Until her twelfth year she was a very intelligent child, and manifested a particularly great gift for history. Suddenly and at once, as the mother told me, the child became lazy and absent-minded. This child, who formerly was very smart, at once became very stupid, so that the mother, who could not understand it, thought nothing good could become of her. She wanted only to talk, but not to work nor to learn. In history, in which she was formerly the best pupil, she got a 4. At the age of 13½, after a slight swelling of thyroid became manifest months before, menstruation set in, and after that the whole picture changed at one stroke, as it were. The child exhibited again a desire to work, and developed perceptibly in body and in mind. She became as intelligent as she was formerly and gave no cause for complaint.

Absent-mindedness occurs in children very often. In many cases it is due to adenoid vegetations in the nose. In such cases

disturbances of blood-circulation in the nose takes place, the mucous membrane of the nose becomes highly hyperemic, and on account of the previously described relations existing between the blood-circulation in the nose and that of the brain, the blood-supply of the brain-cortex becomes impaired. Such children, as a rule, suffer from lack of desire to work, absent-mindedness, and inability to concentrate attention. This condition is, therefore, called by Guye³ "aprosxia nasalis."

A striking indifference of mind, lack of will-power, lack of desire for any mental or physical work exists also in degenerative conditions of the thyroid, and particularly so in myxedema. As I have been able to observe, such patients are so slow-witted that they reflect a long time before they take a step. They preferably remain seated for hours, similarly to the above-mentioned patients with melancholic depression. As in myxedema, here also the blood-flow to the brain-cortex is diminished. We can easily understand this if we keep in mind the influence of the thyroid gland upon the blood-supply to the brain-cortex, which we have frequently considered. We have repeatedly pointed out that the thyroid is the regulator of the blood-circulatory conditions in the brain-cortex, and based upon that we can best understand the favorable effect of thyroid treatment upon the mental activity in cretins, as well as the awakening of a previously complete lack of will-power and energy. Instead of the previously total lack of attention, an increased interest for all kinds of events is aroused. I would lay particular emphasis upon the influence of thyroid treatment upon the will-power. The will—as I am tempted to define it—is an acute and continuous concentration of attention upon *one* definite subject, and to this are continually directed all our thoughts; the stronger the will, the more it becomes manifested. Such a straining of the cerebrum depends most eminently upon the blood-supply to the brain-cortex. The greater the blood-flow to it, as, for instance, through animation and excitement, the more is the increase of

³ Guye, *l. c.*

the will-power and energy, and desire to work; but the weaker the blood-circulation, the more do these features become lowered, and with it also the pleasure to work. How distinctly do we observe this, for example, in badly nourished individuals. That through bad and entirely insufficient food men lose their will and energy, and become entirely unfit to do any mental work, and become forgetful, is shown distinctly in the example of Napoleon's soldiers during their retreat from Moscow. Many of them even forgot the names of the most common objects, and even their own names.⁴ Of course, besides hunger, the extreme cold played its part. And that the blood-circulation in the brain is particularly influenced by the food and changes in temperature we have repeatedly mentioned in this book, as well as in the book "Rational Diet."

Much more frequently than perfectly developed myxedema occurs simple weakness of the thyroid, which has been described more thoroughly by Hertoghe,⁵ and also by the author in his book "Old Age." This condition can be observed so often that it may be called an everyday occurrence, and offers an explanation for the frequency of the cases of laziness and lack of desire to work. Of particular importance is the influence of this condition upon the disposition. Spells of melancholia—the so-called "idées noires" of neurasthenia and hysteria belong to this—are very frequent, and in the down-hearted disposition, due, in all probability, to the existing slower blood-circulation in the brain-cortex, desire to work is lacking; and sluggishness and laziness are the result. Here, too, also belongs that mental torpor, that sluggishness of the disposition and mind, which is found in fat individuals, as described in chapter iii; and this, also, originates from weakness of the thyroid. If thyroid tablets are administered to such lazy, indolent pupils or adults, one may sometimes see real wonders. Laziness disappears and gives way

⁴ Dr. A. Rose, Napoleon in Russia. Medicohistorical. New York, 1913.

⁵ Hertoghe, Der chronische gutartige Hypothyreoidismus. München, Lehmanns Verlag, 1898.

to pleasure for work. I was able to observe in such pupils that they wanted to read all day, and did not put the book out of their hands. It is well known that even a normal individual does not always feel disposed to work. I have experienced it myself when, away from my occupation in Carlsbad, on my long journeys during the winter, I had no desire at all to do any mental work. If I then took 1 or 2 thyroid tablets I would wake up in the morning with more desire to work. I would, nevertheless, not consider it justifiable to use thyroid tablets on perfectly healthy individuals. Thyroid is not a harmless remedy; if used where indicated it may do good in the hands of an experienced physician, but *it may do just as much harm if used by the inexperienced.*

CHAPTER L.

HINTS IN REGARD TO THE RATIONAL FEEDING OF SCHOOL-CHILDREN.

IN visiting various educational institutions I was able to observe very frequently that badly nourished pupils do less well in school than the better nourished. They remembered badly what they had learned, and were often absent-minded. That a child which grows and, in addition to it, studies, must use up more energy is clear, and when we consider that children with their greater impulse for motility must use so much more energy, it necessarily follows that they require plentiful food. The latter must be varied, and must answer various requirements. The growing skeleton demands much phosphorus and calcium, and the same is true in regard to the other growing organs, the cells of which, as, for instance, of the brain, also require calcium and phosphorus. The tissues are urgently in need of plentiful albumin to replace the increased loss caused by the impulse for movement, and, consequently, this must also be supplied in sufficient quantities. But sufficient carbohydrates also are needed, as the child's organism never rests, but is constantly in motion, so that the muscles urgently require glycogen, and this can be best supplied by carbohydrate-containing food, such as rice, farina, potatoes, etc. The growing skeleton of the child requires, first of all, certain minerals, also phosphorus and calcium. Just as the impulses for the function of the central nervous system in a general way are coming from outside (sensory perceptions), so can also the elements required for the building up of its cells—phosphorus and calcium play here an important rôle—be introduced into the body only from outside through the food. The best way to give children phosphorus is in the form of food containing very much phosphoric nuclein-

albumin (investigations of O. Loewy).¹ Such a phosphorus-containing food is animal liver; also calf's sweetbread, kidney, etc.; also eggs, milk, and cheese. If we want to give school-children much phosphorus, the above-named foodstuffs must be plentifully present in the food, particularly because they contain at the same time much calcium; indeed, they even belong to those substances which contain calcium most richly. Unfortunately, these foodstuffs belong, at the same time, among the most expensive things, and, therefore, not easily accessible to parents of poor school-children. These would also do better to give their children, instead of white bread, the dark rye bread which contains more phosphorus and calcium; the latter are extracted from the white bread by the city mills, and it is to be regretted, therefore, that the times of the old village mills are over. It would be possible, however, to add calcium and phosphorus to the flour by dividing it into two parts and putting phosphorus into the water to be mixed with the one and calcium into the water to be mixed with the other part.

A rational way to supply school-children phosphorus and calcium would be to add to the water used in mixing the flour 0.7 per cent. weight molecules of Na_2HPO_4 , and 0.55 per cent. of calcium chloride. It is then formed into 1 per cent. CaHPO_4 , and it would thus be possible to give easily to school-children in bread and also in pudding form a calcium phosphate which has the great advantage that it becomes digested in the stomach.²

The bread should, of course, not constitute too great a portion of the diet, as unfortunately so often happens in poor families, because then, as is shown by the investigations of Rubner about vegetarian diet, the assimilation of other foodstuffs prevented, and that causes a weakened condition, and this we must avoid by all means in school-children. It is a cruelty,

¹ O. Loewy, Untersuchungen über den Nucleinstoffwechsel, *Archiv für Pathologie*, 1906.

² I am under obligation to Dr. George Lebfm, the food chemist in Berlin, for this personal suggestion,

indeed, when children, who must study during their growth period, have to go hungry. In this way learning becomes difficult, and the object of schooling is not accomplished. Considering that the poor children constitute the majority of the future adults, that they represent the future of the nation, it becomes evident that the greatest care should be taken that they should not be too poorly fed, and this on account of the tuberculosis to which the underfed are particularly predisposed.³ A farmer who has live stock would always take particular care that the young brood should be in good condition. It is extremely remarkable that, only in respect to the human stock, notwithstanding all humanitarian fads in our country, so little has been accomplished. In view of the fact that the main care of a modern State is to have a good army, the most simple foresight should be convincing that if well-fed school-children make the best students, they are going to make later the most intelligent soldiers. That at the present time wars are not decided by superior power and bravery, but by the intelligence of the leaders and subordinates, we have already repeatedly mentioned in this book. Besides that, mentally and bodily well-developed school-children may later become the most useful citizens, whereas insufficiently nourished and insufficiently schooled children are only liable to increase the number of those elements in the State which cause material damage, either by their crimes or by required expense for keeping them in hospitals. By spending one dollar in feeding a school-child, one hundred dollars could be saved later. Considering the fact, however, that the State has apparently not the sense for such good business, and also has no money at its disposal, it would be very desirable if, following the example of many great American and German towns, also of the city of Bradford in England, we had private societies formed for the purpose of supplying school-children with a dinner. The city administrations could show us here a good exam-

³ Lorand, Rational Diet, etc., Chapter: Tuberculosis as sequel Disease of Underfeeding.

ple, and the money spent for that purpose could be saved in the budget of the hospitals and institutions for tuberculosis. It would also be a brilliant deed to culminate the life of many a man if, instead of bequeathing a sum of money for a mausoleum to cover his decomposing body, he would leave a bequest for feeding poor school-children. The best tombstone would be a plate with his name on it as the endower, above the sickbed of a poor child, as is so often found in England and in America, and so seldom in our own country; or as a founder of a home for feeding poor school-children. Well, also, the name written on the wall in the vestibule of a public library as being its founder, because anybody who helps the people to increase their knowledge and education gives them thus into their own hands the means to earn a living.

CHAPTER LI.

GREAT MEN WHO WERE SICKLY CHILDREN—LONGEVITY OF GREAT MEN.

WHEN we study the biographies of great men it must appear to us remarkable how often it is related that such men were weak and sickly during childhood. It is not impossible that there exists some connection between that condition and the development into a great man later. It is, first of all, certain that if a child has no opportunity to play it would, if it is intelligent, feel wearisome and long for some occupation; and such a sickly condition, particularly of the nervous system, not rarely occurs just in early matured and intelligent children. Such children, indeed, come not rarely from families in which nervous and mental diseases are common, or where there are some other certain diseases closely connected with the nervous system, such as diabetes, for example. Diabetics very often have nervous, early matured children.¹

Now, if such an early matured and sickly child is compelled to spend the whole day indoors, it is quite natural that it will do much reading, or if it is of a thoughtful nature, it will think over various things, even if only for the purpose of passing time. James Watt, the great inventor, was sickly when a child; he was compelled to stay at home, and was reading all day. Albrecht von Haller was also a very delicate child, and was diligently gathering all kinds of knowledge. The same with Descartes, who had to stay in bed until 11 o'clock, during which he used to think over philosophical problems. Blaise Pascal suffered from infantile paralysis, and thus had the leisure to occupy himself with philosophy and mathematics. Particularly among the great thinkers and philosophers we find that they were of deli-

¹ A. Lorand, *The Practitioner*. London, October, 1905.

cate health during childhood. So, for instance, was Kant a weak child; also Locke, Francis Bacon, Newton, Pope, Bentham, and many others. Helmholtz was a sickly child with dropsy of the brain; Rousseau's birth cost his mother's life. In many of those great philosophers the parents were even doubtful whether they would be able to bring up these delicate offspring. Kant said about himself that throughout all his life he was neither sick nor well. He always had stomach or intestinal complaints. Rousseau was always somewhat sickly, and was always afraid of death. Voltaire always had gall complaints. Among the thinkers and great scientists we find very many who attained a very old age, and some of them, notwithstanding their sickly, weak disposition; this was the case with Kant, Newton, James Watt, Bacon, Alexander von Humboldt, and many others. I am inclined to attribute this to their great intelligence, because the latter enabled them to take better care of themselves. The intelligent individual notices at once the slightest deviation from normal, the first indications of an approaching disease, and can take precautions against it, and at once seek medical aid; his intelligence also induces him to moderation. Children of alcoholics, on the other hand, will, in most instances, also become drinkers, because the often simultaneously existing low mentality will unfortunately not keep them away from it. In the life of great thinkers we find very often as characteristic a well-regulated mode of living with great moderation. As an example I may again mention Kant, who, notwithstanding his delicate health, reached the age of 80, thanks only to his frugal mode of living. Kant used to get up regularly at 5 o'clock in the morning, summer and winter, and, as is related by his attendant Lampe, in the course of thirty years, he did not miss once to answer his call to get up in the morning. His diet was also a very plain one, as is becoming to such a great and critical thinker, who wrote the "Criticism of the Pure Mind." I have mentioned before that for the mental worker who needs for his work much creative phantasia, a rich meat diet is the most

appropriate, and, in fact, we see that the elder Dumas, Victor Hugo, and others were great meat eaters.

Contrary to this, we see that in occupations where cold, sober criticism and a keen mind constitute the most important requisites, as, for instance, in mathematicians, these men lived in moderation, and used a very plain diet. Moebius² said: "A meager diet is apparently not injurious to mathematics, because many prominent mathematicians have been starving." The mathematician Kästner said: "I am not afraid of any siege, as I have learned in Leipzig how to starve." Moebius also points out that all mathematicians have lived in moderation, and have attained an age above the average. In regard to the longevity of great minds, we actually find that the great thinkers, philosophers, mathematicians and great scientists, undoubtedly due to their, in general, rational mode of living, have attained a high old age. Alexander von Humboldt reached the age of 90, Kant was 80, Newton 84 years, Locke 71 years, Helmholtz 73 years, Herschel 84 years, Euler 76 years, Galileo 79 years, the great mathematician Gauss 78 years, Laplace 78 years,—Monge 72 years.

Only seldom do we see very short life mentioned, as, for instance, in regard to Pascal, who died at the age of 29 years. He, however, suffered from a very serious nervous disease all his life, and was much inclined toward mysticism—he even became the follower of the heretic bishop, Jansen—and later became actually insane. Spinoza did not reach even 50 years of age; he overworked himself, and at the same time so insufficiently fed himself that he lived some days only on milk, soup and bread, and spent only about 7 cents a day; no wonder that he acquired a chest trouble. Descartes, after quite an adventurous life, reached only 54 years. His end was surely hastened by the tutoring of Queen Christina of Sweden, which had to be done in the winter at 5 o'clock in the morning in the unheated library. The adventurousness of his disposition is apparent

² Moebius, *Die Anlage zur Mathematik*, S. 121.

from the fact that, though having a yearly income of 6000 francs, a very great sum at that time, he enlisted as a plain soldier in the service of Prince Moritz of Orange. With these few exceptions, other great scientists have mostly reached old age. This cannot be said, unfortunately, in general about the geniuses which work with phantasia (imagination). Particularly not about composers; for instance, Mozart was very young when placed in his beggarly grave, which was in no proportion at all to the brilliant entertainments given in his honor. Only very few followed his funeral. He dug, however, his early grave himself by his immoderate life, and much were his parents at fault, because they allowed him, as a sickly child, to travel throughout half of Europe during the winter. Having been rocked on the lap of an Empress as a child, he, not quite 30 years of age, received a pauper's grave. So many of these great geniuses, as if consumed by an inner fire, have lived without taking any consideration of the hygienic requirements of the body, and without sparing themselves. Particularly have they not spared themselves during their mental work, but exposed themselves to overstrain and overexertion. In view of the fact that very many geniuses as children have been afflicted with nervous disorders, as Schopenhauer for example, it is no wonder that they have manifested later mental disturbances. Very often are found also symptoms of arteriosclerotic changes of the brain-vessels as a result of overstrain, of an *early consumption*. The longevity of those scientists who attained old age would probably have been still greater if they had not acquired arteriosclerosis through overwork. This was generally of frequent occurrence among them, and is probably the reason why not rarely in their old age they showed some manifestations of beginning mental decline, as, for instance, Kant, Monge, Ampère, Newton, Huygens, and others. Kant had symptoms indicating intermittent lameness, and had a paralytic stroke shortly before he died. Linné, Copernicus, Helmholtz, Faraday, Davy, and very many other scientists had a paralytic stroke, and the death

of Euler also suggests arteriosclerosis. The great Hungarian mathematician Bolyai died from a stroke; Robert Koch died from arteriosclerosis. When we, however, take into consideration that Francis Bacon, Kant, Locke, Newton, Haller, James Watt, Humboldt (who became 90 years old), and others have been weak and sickly children, the fact that they reached such a respectable age must alone be attributed to their moderate frugal mode of life.

CHAPTER LII.

GREAT MEN WHO WERE EAGER READERS IN CHILDHOOD—THE ADVANTAGE OF MUCH READING, AND OF DILIGENT, PRIVATE STUDYING.

ANY physician who has the intention of having his son follow the same vocation, and would make of him a capable physician, should give the boy, first, a beautifully illustrated zoölogical work written somewhat in the style of Brehm's "Animal Life." After that he should give him an interestingly written book on zoölogy, in which the anatomical parts are also presented with pretty illustrations. Following this, he should give him a botany with good illustrations, in which the practical value of the plants and their medicinal qualities are pointed out. If thus in the boy be awakened pleasure in animals and plants—in regard to minerals the same could be done—he would surely then enjoy strolling around in the open country, in the woods and the field, making his own observations. In this way he would sharpen his eyes; he would learn to see everything and note it, and such acute observations would be the best foundation for making of him a capable physician. Further on, thanks to his awakened love for nature, he would follow up with interest other branches of the natural sciences, physics, and chemistry; and this could be encouraged by putting at his disposal well and clearly written—not in the dry teaching style—books on physics and chemistry. If he sees in addition, in school, experiments with various chemical substances, he will, conforming with the taste of youth, read at home with still more pleasure, not in his short textbooks, but in popular works written with greater interest and supplied with beautiful illustrations.

Such private reading, such private diligence, which is worth gold, should be encouraged by all possible means, because, as the examples of many great men show, they have been eager readers

during their childhood. Albrecht von Haller began as a child to study grammars of various foreign languages, even the Chaldean, spending the whole day in reading, which he was, by the way, compelled to do on account of his delicate health. The great physicist and mathematician Ampère was, as Moebius said: "A vulture in reading" (*lesegeier*), who read through all the twenty volumes of an encyclopedia, which fell into his hands, one volume after another. At the age of 14 he received from a bookseller the works of the great mathematicians Bernouilli and Euler. When he was told that the books were written in Latin, he learned Latin for the purpose, and then studied the books. This child was, moreover, so gifted for mathematics that even before he knew the numbers he was figuring with little pebbles and beans. And when once he was sick, and after three days fasting received a piece of zwieback, he did not eat it, but broke it and used the pieces for figuring. Even in his boyhood days Francis Bacon read philosophical treatises, and already then showed an aversion toward Aristotle, on account of "the unfruitfulness of his ways." How smart the child was is shown by the answer he once gave to the queen; when she asked him how old he was, he answered: "Only two years less than the happy reign of Your Majesty."

Pascal engaged himself with mathematical problems as a child, and at the age of 14 he published his paper about the conic sections. Abraham Lincoln, also as a boy, was so eager to read that he borrowed all sorts of books from the farmers in the neighborhood, and read them all day. I am inclined to attribute to this private reading of a child great importance for his future life, of course, only when useful books are read and not backstairs novels. The latter, as well as robber novels, may often do great damage to children with their undeveloped experience and judgment. They can even be the cause of crimes in minors, or even induce them to leave their parents' home for adventures, and imitate the life of Robinson Crusoe in some distant parts of the world.

When a child shows such a craving for reading—usually they are intelligent or early matured children—we must consider it as a manifestation of nature, as a kind of instinct driving them to gather experience about this world. We must, then, direct this passion into the right channels, and as much as possible encourage them; of course, without doing harm to the development of the body. It is very important that only good books should be given into the hands of children, preferably such where useful knowledge is presented in narrative form. The selection of the subject is best made according to the congenital inclinations of the children, or the educational purpose set in view. At any rate, a congenital inclination for a certain subject should be encouraged by all means, and particularly private reading of valuable books in the direction of their inclination. The present-day school, with its levelling of everything to one pattern idea, is averse to such one-sided inclinations and abilities, even killing all originality, and so appeal must be taken to the private diligence of such children. Of course, it may then happen that by giving themselves up entirely to such studies the subjects taken up in school are neglected, and then talented children make bad pupils. This has, however, very little to do with their future position in life. Indeed, it can be observed often enough, and I saw it in my classmates, that those who have been hardest pluggers in school occupy only a very moderate position in life, and the so-called bad pupils attain the highest positions or become distinguished men, and this not because of the school instruction which they had received, but due to the privately pursued studies. In school they were bad pupils because they had to learn there, by compulsion, subjects which they did not like, but when out of school they could devote themselves to studying subjects which they preferred, and have accomplished great things. This private application, perfecting congenital abilities through much reading, observation and exercise, I consider as the surest road to future greatness. What was acquired by private studying I rate much higher than what was learned by more

or less compulsion. If anyone gets continually deeper into the same subject, he very soon finds in it something new every day which remained unnoticed to other investigators, and thus the way becomes paved for important discoveries and inventions. Such strong private diligence and private study—wherein all compulsion is gone—has led many a poor boy to highest positions, for example, Gottlob Nathusius, once a poor errand-boy, became a millionaire, and one of the greatest merchants in Germany. As he had no means to buy books for himself, he saved every piece of waste-paper whereon was printed an article on commerce and industry to read them over during the earliest morning hours. The love for reading induced him to use all the money he could spare from his meagre wages in buying valuable books, for instance, the works of Adam Smith "On the Nature and Cause of National Wealth," which he read through so often that he knew it by heart. His knowledge acquired in this fashion has then brought him forward. The great physicist Faraday became a bookbinder apprentice only to satisfy his desire for reading. Rousseau, even as a small boy, swallowed all kinds of books which got into his hands: novels, also Virgil, Horace, books on astronomy, etc. Helmholtz, as a boy, read with passion all books on physics which he found in his father's library. Liebig, again, read as a boy all books on chemistry which he could find in the court library. Humphry Davy, when a boy, also read everything that fell into his hands. The future course of development of these great men was undoubtedly very favorably influenced by the diligently pursued private reading. Leibnitz had, as a child, a great desire for reading, and so his father opened his library for him, and said, "Tolle, lege." Also when an old man he was so very eager to read that he hardly got up from his seat for days.

A similar example of a ravenous desire for reading was also presented by the distinguished optician, Fraunhofer, who served as an apprentice to a hard-hearted master who prohibited him reading. He was mostly compelled to go outside

of the city limits to be able to read undisturbed. The great mathematician Fourier, who, as a son of a poor tailor, was brought to the school of the Benedictines by a bishop, remained up whole nights to study by the light of small candle stumps which he collected in the kitchen and the passageways of the college. The great physicist Arago, from whose speech delivered in memory of Fourier the above data are taken, is the instructive example of the success of private diligent study and ravenous desire for reading. He was such a bad pupil that he was hardly able to read properly at the age 12 years. Then a lieutenant awakened in him the desire for mathematics by telling him that with the knowledge of it he could enter the school of polytechnics. He then had sent to him mathematical books from Paris, and thus studied alone the analysis of the infinite by Euler, the *Mécanique Céleste*, by Laplace, etc. When he, at the age of 14 years, was examined by Monge for entrance into the school, the latter was struck by the wide mathematical knowledge of the boy. From the example of Arago, and from my own experience as well, I draw the conclusion that what a man knows really well is mostly not what he learned in school, but by his own diligent private study. I look upon the object of school to be mainly not so much the acquisition of knowledge as the instruction in the ways and means as to how the knowledge can be acquired by private studying. It should encourage private home study without compulsion. A boy learns something much more willingly when it is not done by compulsion, but when impelled to it by his own inclination. Those parents may be considered lucky whose children have such a desire for reading; of course, only if it is directed into the proper channels. Reading without selection should not be permitted, because this may lead to overexertion, and do rather harm. Only that should be read which is of value and can be used; and, first of all, it should be read *critically*. Corresponding with the grade of their intelligence, readers will proceed differently. The intelligent would overlook what is evidently false and untrue, and would not over-

burden his memory with it, whereas the stupid would harm himself by much reading without judgment. Just as little as the dull may be made wiser by teaching can he be made so by much reading. Moreover, it can be very often observed that only intelligent children and adults manifest a desire for reading useful books. By extensive reading a man can enrich his knowledge; and, if it is carried on in a rational way, also his store of experience, and thus, the same as with learning, increase his ability of judgment, because much reading means much learning. Descartes¹ said that study should be for the purpose of being able to judge better. Just as what was studied, so also what is read, can be retained best if, as Albrecht von Haller did, one reads always with the pencil in his hand and continually makes notes. Plinius, senior, was a great reader, or, more properly speaking, he had somebody reading to him all the time, whether he was eating or taking a walk. At the same time he had a secretary with him whose duty it was to make extracts for him. A more ardent reader and student than the great Albrecht von Haller has hardly ever existed. He was reading while on the street, at the table, and even on horseback. His knowledge was astonishing, and it also was many-sided, just as we admire it in other great old masters, such as Erasmus of Rotterdam, Boerhaave, Swammerdam, in contrast with frequently one-sided, dry scientists of the present day. He was not only a great naturalist, but also a poet and historical writer; and, besides that, also a kind of Mezzofanti. While he was making a post-mortem examination he learned from a Swedish hearer the principally used Swedish expressions. He asked him the meaning of the different words, and thus, after a short time, he was able to speak Swedish!

The old great masters were, in general, exceedingly well read and of such many-sidedness that they could put many of our present scientists in the shade. Boerhaave was not only a great physician, but also at home in philosophy, in the various

¹ Descartes, *œuvres* xi, S. 130.

dead languages, in Chaldean, and in Hebrew. He also delivered lectures in mathematics and in philosophy. Pascal was a mathematician, a physicist, a philosopher, and a writer. His "Lettres Provinciales" passed through sixty editions. Kant was very efficient in astronomy and mathematics, and, at the same time, one of the greatest philosophers in the world. Most-sided, however, was Swedenborg, whom we have already mentioned. Besides his medical publications, which some years ago were recommended by Professor Neuberg in Vienna, and in which were expressed views which have now been confirmed, he was editor of the first journal on natural history in Sweden, of the "Daedalus Hyperboreus," and regular assessor of the Swedish Miners' College. By a number of publications he has proven to be a genius in the domain of mathematics, astronomy, geology, mineralogy, metallurgy; and his cosmological publications made great impression, and have shown him to us as a forerunner of many great discoveries. He also published great medical and theological books. He was also one of the founders of the Royal Scientific Society in Upsala. At that time many distinguished theologians and philosophers were also studying medicine. Bossuet, the distinguished preacher, described the stomach-juice as a very sharp-tasted watery substance which so cuts the meat apart that it entirely loses its original form. He called the arteries the peripheral hearts, and foresaw the life doctrine of Flourens long before him. Descartes also diligently pursued anatomical studies in Port Royal to find the seat of the soul, and was recklessly cutting into living animals, as, according to his philosophy, animals have no soul, therefore present only dead matter, and consequently cannot feel.

Such stupendous many-sidedness would be indeed an exceedingly rare occurrence in our days. We must not forget, however, that the general enormous increase in our knowledge in all domains makes it, in comparison with former times, very difficult to acquire universal knowledge. Many-sidedness is, anyhow, a qualification which is only seen in geniuses, as in Goethe,

for instance; and in such geniuses our century is lacking. The eight to nine years of study in a school takes away too much energy and leaves no time free for ardent manifestations and continuous practice of ingenious dispositions, which is the only way possible to accomplish something really great. It is, therefore, no wonder that there were great classics and geniuses only until the beginning of the nineteenth century, when the introduction of the college and school examinations began to show their fatal effect. Nowadays we live more in the age of one-sidedness. A scientist, for instance, becomes absorbed in metabolism work of a certain branch, and he cultivates that until his death; everything else leaves him entirely uninterested; besides he would never have the time for anything else, even if he wished it. Until first youth is nearly over, one is engaged nowadays in compulsory studying for the sake of getting some position, and only then does it become possible to devote one's self to studies of inclination. And just such studies that a man pursues with pleasure are those which may lead him to something great. If a father wants to make of his son a distinguished man he can best accomplish that by arranging so that his boy may learn everything with *pleasure*, and then devote himself with *pleasure* to those subjects which are connected with his career. If, however, he takes up a vocation by compulsion, he will never show any diligence privately, and will never accomplish anything of importance. He will only be a man of *mediocrity*.

CHAPTER LIII.

GREAT MEN WHO WERE BAD PUPILS.

THE great Orientalist Klapproth was a bad pupil. When he failed in examination, the professor said to him: "You know absolutely nothing." And his answer was: "Not quite; I know Chinese." This was investigated, and it was actually found that he had learned that difficult language by his own effort. We indeed observe that children, and also young men who can follow up, by their own inclination, a subject for which they have a special desire and love, may accomplish very great results in it; even become great men in this way. The secret for cultivating great men, therefore, would consist in developing the congenital faculties in children, and then by all means encourage them in that direction. We observe, however, that instead of following this method, irrational parents, and very often also the school-teacher, take the greatest pains to kill such talents at the start. We see this, for instance, in the life history of Michel Angelo, whose proud, noble father wanted to compel him, even by physical punishment, to relinquish his inclination for modeling figures. Pascal's father hid away from his son all geometrical figures, but at the early age of 10 he had drawn with charcoal all kinds of such figures on the floor of his room. Händel, when a child, could play only secretly because of his father's prohibition. Galilei, against his wish, was forced by his father to become a physician. During lectures, however, he studied the mathematical works of Euclid or Archimedes instead of the works of Galen. Helmholtz during the Latin hours figured out, under the bench, the passage of an optical pencil of rays through a lens.¹ He was just as bad a pupil in the dead languages as Liebig, who was really "a disgrace to the school."

¹ W. Ostwald, *Grosse Männer*, II Auflage. Leipzig, 1910.

Robert Mayer was a very bad pupil (particularly in Latin), and Humphry Davy could not manage to pronounce French. That such pupils were distracted by their preference for other subjects, and did not follow the lessons, is quite natural; they became absent-minded, did not take notice, and thus, although otherwise very talented children, became bad pupils. Newton was a very bad pupil; instead of doing his home work he used all his free time for making mechanical instruments, and he became a real master in this. Tyge Brahe, the son of a Danish noble family, was supposed to study jurisprudence in Copenhagen; when, however, in August, 1860, he saw a sun eclipse, it made such an impression upon him that he studied astronomy secretly. His tutor hindered him during the day, so he remained up at nights to study the sky. He naturally became a bad lawyer, and so the family decided to let the boy follow his inclinations and sent him to Augsburg to study further. Often talents become manifest in children by some accidental event, which awakens in them a great desire for something. All children, as true egoists, do preferably what they have a fancy for, or what stimulates in the highest degree their curiosity and their interest. The distinguished mathematician Sophie Kowalewska, when a child, often heard her uncle talk about the beauties of the study of mathematics. This awoke in her, as she herself relates, love for mathematics.² It also made a deep impression upon the child that the children's room was papered with notes on differential and integral calculations from the lectures by Ostogradki, which her father, who was a general of the artillery, had attended. These walls, covered with mysterious figures, very much excited her curiosity, and she often thought of their significance. I am of the opinion that it is possible in this way very often to cultivate intentionally in children an inclination for certain subjects and great faculties. It is necessary, when so doing, to study their special dispositions and correspondingly give them practical exercises for their senses by showing them

² Moebius, *Die Anlage zur Mathematik*, S. 88.

various kinds of pictures and figures, or by giving them various kinds of sensibly constructed toys. After discovering such much-promising inclination, nothing else remains to be done but to allow its free development. If a child only has intact sensory organs, and these are sharpened by exercise, and the child thinks correctly—in so far as children are able to think—it is possible, in my opinion, to make anything of the child, within certain limitations, of course, offered by its congenital disposition. By testing the various senses it should be established which of the senses is least developed, and according to that select the plays, pictures, etc., which are given to the children to play with so as to unfold those senses. *The sharpening of the senses in children should, in general, be the main care of education.* Sometimes by accident—and these could be intentionally produced in the interest of the child's education—great inclinations and faculties may become unfolded in children as well as in adults.

Cuvier was once, as a badly paid private tutor, taking a walk at the seashore in Normandy. The breakers threw out a cuttlefish on the beach before him, and this excited his curiosity. He took the cuttlefish along with him, and studied it carefully at home. This awakened in him interest in mollusks, and then in all other animals, and he became one of the foremost naturalists.

I experienced something similar myself. In 1878 there came into my home town, Nagy-Kanizsa in Hungary, a committee of Turkish students—they made a round trip through Hungary—and in the streets were heard hurrah cries in Turkish, "Csok Jasa." I heard, as a small boy, these exclamations, which very much excited my curiosity, and so I bought from my meagre spending money the Turkish grammar by Erödy and learned Turkish. Because I stayed up with it half the night, however,—everything that I undertook with desire and interest I have always done with great diligence,—I neglected the school subjects which did not interest me, and when my mother found me twice at 2 o'clock in the morning studying Turkish, she took the grammar and hid it away. When I found it again and was

studying again, she burned it. I then acquired a Spanish grammar and studied Spanish; then I bought a Russian grammar and studied Russian, and thus, notwithstanding all the whippings I received, I learned simultaneously several languages. Of course, my parents did not anticipate at that time how useful this knowledge of languages would be for me in my future professional calling and in travelling.

When the love for the languages of foreign nations is awakened in the child, it is very easy to get it interested also in the habits and customs of those nations, in the geographical conditions of the countries where they live and in their history. Intelligent children will surely wish to read diligently all possible books about these countries. And what a boy does by *private* diligence, he always notices, and much more easily remembers than what he has to learn by bitter *compulsion*. If, therefore, intelligent, early matured children have an inner longing for much reading, it is possible very easily to have them acquire useful knowledge by leading them in the proper direction, and this may also lay a foundation for future greatness. This was the case with many great men, such as Ampère, Goethe, Kant, Rousseau, Leibnitz, James Watt, Faraday, Humphry Davy, and many others. It is also necessary to endeavor to put in their way intentionally such opportunities as the cuttlefish in the case of Cuvier. In the education of such early matured children, however, who are, as a rule, nervous, and are not rarely coming from families in which nervous and mental diseases are on record, the greatest caution must be observed.

At any rate, under no circumstances should the physical education of such children be neglected on account of the mental. It is just in such cases that the overexertion may have very bad consequences, and it has very often happened that a perverted education has made entirely useless men out of such wonderful children. Children must grow, and to that end it is of great importance that they should have abundant good nourishment, and spend much time in the open air (sunshine).

Whereas a child can easily master a subject for which it has a passion, and may accomplish something great in it, we see, on the other hand, that even most talented children often accomplish nothing if they have aversion to the subject. Fatigue and mental overstrain may very easily then result; a congenital disposition is also here mostly at fault. Sometimes there is a wonderful, exceedingly great gift for one subject, as, for instance, for mathematics; and it seems as if by this the whole equilibrium is disturbed, so that no room is left for other subjects, as, for instance, for languages, as is shown by the already mentioned examples of great men. Thanks to the lack of desire existing in talented children for grinding at something dry, which does not appeal to them, they make no progress in it. Children who accomplish much in one direction, and are always thinking about their favorite subject (just this intensive attention which they always give to the same subject is a sign of most ingenious acts, of ingenious disposition), often become dreamy and absent-minded concerning those subjects which they do not like. Sometime they even turn their passion to a subject which has no relation whatever to their studies, and it is not surprising then that they become bad pupils. Sir Walter Scott, undoubtedly one of the greatest novel writers in the world, could write novels with exceeding ease, and would read them to others; at the same time he neglected the school-work, and was considered by his teachers as "real stupid." Linné, the great Swedish botanist, was a bad student in dead languages, but instead he was continually engaged in studying plants. On account of his bad school record the teachers advised him to become an artisan. His father sent him to Lund to study theology, but instead of becoming a bad theologian, he became the greatest botanist in the world. If things had gone according to his father's wishes he would have become a respectable minister in some corner of Sweden, of whom the world would never have heard much.

Napoleon was a good pupil in mathematics, but a bad one in languages. The great philosopher Locke was, as he used to

tell his hostess, Lady Masham, a mighty bad pupil in school; and Isaac Newton, as we have already mentioned, was no better. The distinguished Jesuit, Clavius, a great mathematician, was expelled from school for incapability; and Liebig, as already mentioned, was a "disgrace to the school." It is not impossible that this is one of the reasons why a genius does not gain much respect in his own home town. Such a dreaming boy, who shows some real ingenuity in certain subjects, but is entirely impractical, or even dumb, in the usual requirements of this world, is liable to excite the sneers and mockery of his classmates. Some of these children—geniuses—are considered eccentric or crazy; for instance, Shelley was called by his comrades "Mad Shelley." Such children often manifest, even at that age, a tendency to keep themselves separated from their playmates and follow in loneliness their thoughts. Like to Napoleon, when a child, so it has happened to other great men to be ridiculed, and often kicked by other children. This happened with the little Newton, and only after he once kicked one of the boys black and blue, did his colleagues let him alone. Newton, as a bad pupil, sat on the bench next the last, and the boy who sat before him ridiculed him. With iron diligence, however, he studied all the school subjects and outflanked the other. Even the parents of the comrades often laugh over the peculiarities of such children—as they, in their ignorance, generally call such rare gifts in some special direction—or they look upon them as abnormal or fools. Sometimes jealousy has something to do with it. Considering that such children, due sometimes to humble descent, unrefined relations, poverty, shabby clothes, etc., and also may be to some peculiarities, never command any respect, it is hardly surprising that they do not enjoy great distinction in their home town, and home country, when they grow up to be great men. Christ proved Himself to be great in knowing human nature when He said that nobody is looked upon as a prophet in his own home place: "Nemo est acceptus Propheta in Patria."³

³ See Gospel of St. Luke, iv; St. Matthew, xiii; St. Mark, vi, 1-6.

IX. HYGIENIC PRINCIPLES FOR A REFORM OF THE SCHOOL CURRICULUM, PARTICULARLY IN THE MIDDLE SCHOOLS (HIGH SCHOOLS).

CHAPTER LIV.

REFORM OF THE HIGH-SCHOOL CURRICULUM ON HYGIENIC, PHYSIOLOGICAL PRINCIPLES.

The Necessity of Arranging the School Roster According to the Individual Fitness of the Pupils.

It is hardly possible, I think, to find among a million men two individuals who are anatomically and physiologically built perfectly alike. Surely, the same difference exists also in regard to mental qualifications in children and adults, because these are, as we have already pointed out, closely connected with the physical condition of the body. It is, therefore, obvious that it must be very difficult, nay, unnatural, to have a curriculum like that at the present time in vogue in the high schools, which treats everyone alike and puts all the pupils on the same level without taking into consideration the individual qualification, and demands of all the same amount of knowledge in the various branches. Many children manifest many-sided qualifications, but it is well known that with such many-sidedness goes hand-in-hand a superficiality, although fortunately there also exist some exceptions. On the other hand, we find in children a certain degree of one-sidedness which, as a rule, is also associated with a deeper absorption in one definite subject; and this is, indeed, very often connected with a particular deficiency in other subjects. So, for instance, in some pupils, even during childhood, there is manifest a striking gift for languages, but at the same time an absolute unfitness for mathematics; others, again, manifest a gift for drawing, for the visible, which often

betrays an artistic nature, but at the same time there is shown an aversion for theoretical subjects. Children who manifest a most particular gift for mathematics have often, as already said, difficulties in learning languages, no matter how much they are tortured. It may be possible to make them study grammatical rules with the aid of examples, because the useful application of these rules often resembles the solution of a mathematical problem. Only the learning of dead words offers them difficulties, because the words do not mean anything to them, and they do not want to grind it, or cannot do it. For that reason they do not succeed in retaining words, and still less do they succeed in understanding what they have learned, or to speak the language. Unfortunately, such pupils must torment themselves in our schools for years with the dead languages. In consequence of this it may happen that pupils who are entirely unfit for grinding, but may possess brilliant gifts for a physician, an able surgeon and operator—these are real artists, and sometimes artistic natures—cannot follow their inclinations, which would be profitable for all mankind, because they cannot manage the languages, and are, therefore, compelled to follow another career. The question then involuntarily arises whether it is necessary that pupils of heterogeneous gifts should all penetrate equally deep into the same subjects, even into those for which they are absolutely unfit, which means that they lack not the will, but the ability.

The further question is, whether such pupils should really spend the best years, their youth, endangering their nervous system and nervous faculties to drum in such things which they will invariably forget later? If anybody is not fit for studying foreign languages, there is nothing else left for him to do but to plug in the rules and words. Everybody knows, however, that what is plugged in is not of lasting duration. It is surely true that it is best to read Latin classics in the original. If, however, a person who has congenitally no gifts whatever for foreign languages, particularly for the dead ones, and probably

has a congenital aversion for it, wants to accomplish the reading of Ovid or Horace in the original, usually he can only do it—no experienced physician would deny it—at the expense of injuring his nervous system and his mental faculties. It may even lead to serious disturbances in cases in which there is a congenital nervous disposition. Could it not be possible to be satisfied with the reading of Cæsar's "*Bellum Gallicum*," which for many is likewise also a hard nut to crack? Or, still better, could not one enjoy the reading of these authors in translation? And is it altogether necessary that the pupils should grind in the grammar rules like parrots? It is hardly possible to think of a more mind-killing way of learning! Such learning surely encourages plugging, and I believe that it should be the problem of the modern school to prevent plugging in the manner which I have before indicated, and to guide the children to grasp everything with their mind, because only thus intelligence may be promoted. I shall be very glad if these lines be not interpreted as a protest against humanistic studies! Nothing would be further from me than this, as I will myself always remain thankful to the principal of the school in Nagy-Kanizsa in Hungary for the beautiful Latin treasury which I have acquired in the course of the eight years at one hour daily. Moreover, I have studied Latin and all languages in general with pleasure and devotion. Nevertheless, I cannot deny my sympathy for the unfortunate pupils who lack absolutely this faculty and for that reason have been either cut off entirely from studying at the university, for which they have otherwise been well qualified, or who succeeded in doing it only with great injury to their nervous system or mental condition. My argument is that pupils who are very gifted in some special subject and make great progress in it, but make no progress in the others, not because of lack of diligence, but of congenital difficulties in comprehension, as, for instance, lack of the gift for languages or mathematics, should not be deprived of university study, for many a great talent gets lost in that way. I know from my own experience that

many who were very inept high-school pupils, when they entered the university and got a hold of some subject which suited their abilities, became some of the best students. I am also of the opinion that the school should avoid levelling all congenital dispositions and demanding of all pupils the same amount of theoretical knowledge, but should rather attempt, by close observation, to find out the special abilities of the individual pupil and arrange a roster accordingly. When there are too great a number of pupils in one classroom, as is unfortunately the case at present, with insufficient school accommodations due to a false economy, it is naturally impossible to have control over the faculties of the individual pupils. And still it would work well, from a hygienic standpoint, if the pupils were divided into several groups. One group should be formed of pupils who have a special ability for languages; as a rule, with this is generally associated an easy acquisition of geographical and historical knowledge. Another group should be formed of those who have a fitness for mathematics; with this generally goes hand-in-hand a great fitness for physics, chemistry and natural sciences. By the forming of such groups, one for languages and for history, suitable for theoretical instruction, and the other for mathematics and natural sciences suitable for practical instruction, a higher grade of efficiency could be required of some, and for the badly fitted lower requirements could be made. Such assorting of the pupils could take place best by establishing an entrance examination for the high school, whereby the sense-organs and the various congenital abilities could be thoroughly examined by an intelligence test.

The reformed high schools which are coming in vogue more and more in Germany seem to me to be a real progress in the direction pointed out. The foundation laid in these schools is the same. The pupils are introduced to the study of languages through the French and to the study of grammar through the German. The study of the dead languages begins only in the lower sophomore class with Latin, and entering the lower junior

class the pupils have the privilege of deciding whether they desire to take up the humanistic or the realistic studies. Both divisions branch out once more in the lower senior class into two subdivisions, one for languages and another for mathematics. The value of this organization lies, first of all, in the fact that the decision is made at a time when it becomes manifest in which direction the inclinations of the pupils are pointing.

CHAPTER LV.

THE NECESSITY OF AN EXPERT EXAMINATION OF THE ORGANS OF SENSE AND THE INTELLIGENCE OF PUPILS BEFORE ENTERING THE GYM- NASIUM (HIGH SCHOOL).

THE present-day high schools set such requirements on the children during the period of their development, and on young men, that even those with inborn good potentiality and fitness can satisfy them only with difficulty. How great, then, must be that difficulty when the potentiality is deficient. In every high school or manual training school there may be found a number of pupils who, notwithstanding their very deficient mental faculties, are there by compulsion, either because of the parents' ambition, or, very often, for fear of three years' military service. Notwithstanding, very diligent grinding, sooner or later, in such cases a physical and mental breakdown takes place, if the futility of further efforts has not been convincingly shown before by the bad school reports. Sometimes such weak pupils may, with greatest difficulties and by straining all their energy, be able to qualify for the university, but they suffer failure there. To save the parents and the pupils such disappointments, which are sometimes accompanied with grave injury to the body and mind, and to diminish the number of individuals who fail in life, as well as the number of insufficiently educated mental proletariat, it would be better to examine the pupils in regard to their potentiality and their ability before they enter the high school. It is true that we already have at present entrance requirements in regard to elementary knowledge, but this can be easily passed by those entirely unfit by means of grinding. This, however, is just the important point,—that such "grinders," who have no ability whatever, should be excluded. I have been repeatedly told by

high-school professors that just such pupils who passed a brilliant entrance examination by grinding have proved themselves as the most deficient pupils one or two years later, and had to leave school.

I would like to suggest that not the knowledge of the pupil should be examined, but his congenital abilities, and whether he really possess the faculty to discern sensory impulses and make use of them in forming opinions, and is able to think independently. We have already alluded to the importance of perfect sensory organs, and experience confirms the fact that, as a rule, deficiencies of the sensory organs go hand-in-hand with low intelligence. The interior of the eye of every pupil should be examined by an expert oculist to ascertain whether there is any weakness of sight existing. Such may be congenital, and sometimes not discovered until later. An ear expert should further examine the condition of the interior of the ear, the minute hearing apparatus and the acuteness of hearing. Should the sensory organs be found in a good condition, it is also necessary to examine whether they are correctly applied. For this purpose the games according to the Montessori method should be used, which we have described in the chapter on the importance of the sensory organs. Particular attention must be paid to the point, whether the various colors and shadings are well recognized, because very often deficiencies in distinguishing colors go hand-in-hand with very low intelligence, as it has been pointed out by Kannegiesser in Erfurt. He found that intelligence and color recognition are proportionate. Normal children of 5 or 6 years are able to indicate all colors and shadings. In apt students have, according to him, the lowest ability to distinguish colors. When the examination in sensory exercises has been successful, the next in order would be the examination of the intelligence by a psychiatrist. This could be done best in the order recommended by Cramer¹ for testing the intelligence in general. It is necessary to establish whether the pupil understands various

¹ Cramer, *Allgemeine Zeitschrift für Psychiatrie*, Bd. lxxvii, 1912.

words and is able to repeat them after 1 or 2 minutes. Next the reverse associations should be examined, whether he can recite the names of the months, weeks, and days, in reverse order, and whether he is able to count the numbers from one hundred backward. Next would come questions about the difference between various things, as between a bird and butterfly, between ice and water, misery and thrift; also descriptions of various objects. Further on should follow definitions of various objects and ideas, as, for example, what is a watch, a judge, a physician, a merchant, etc. Then a proverb with a moral in it, or one of the Commandments, "Thou shalt not steal," could be recited, and the reason for it asked. From the answers given in regard to the difference between various things, the sagacity of the pupil can be easily recognized. The experiments consist, for instance, in the picking out of an easily recognizable false coin among many good ones (a 5-year-old Dutch girl was able, in the course of my experiments, to pick out among ten silver guldens the one that was false); or in arranging five little boxes, as proposed by Binet, according to their weight; or in giving the change from coins of larger value; in the definitions of various conceptions; or in giving the reason for a proverb. By all of these it would be possible to recognize very easily the inborn wit of the pupil. Next would come formation of sentences from three given words, as hunter, rabbit, and field; or, judge, thief, and jail.

Finally, the mechanical memory could be tested following Ziehen's proposition, by telling a very simple story once and having it repeated. As most appropriate for this purpose may be recommended Æsop's or Lafontaine's fables, and hereby it would easily be possible to establish whether the pupil is able to concentrate his thoughts or not. If he should lack in that, he may then also be considered unfit to learn. I may, here again, repeat the instance with the monkey trainer, related by Darwin, who never bought a monkey if he noticed that it became distracted from instruction by every passing fly.

While the above-mentioned tests of intelligence are applied for testing mental disease, I think that it can be applied equally well for testing the mental faculties of pupils applying for entrance into high schools. In case a pupil does not give a satisfactory answer, it is necessary to establish whether the pupil did not become confused while giving the answer, and this can be easily established by an experienced psychiatrist. That a normal pupil should give unsatisfactory answers to the majority of the questions can hardly be assumed. If the result of the examination should be bad, it would be necessary to undertake a thorough physical examination of the applicant. It should be ascertained whether there are adenoid vegetations; whether the ductless glands, such as the thyroid, sexual glands (cryptorchismus) are not deviated from the normal (retardation in growth, formation of the teeth, condition of the thoracic skeleton, etc.); whether the subject is well nourished. Generally speaking, every child should be thoroughly examined physically before entering school. I would further suggest that of each child entering school a biological record chart should be prepared, and at the head of it should be entered the hereditary disposition (father alcoholic; poverty of the parents; position of the latter; housing conditions,—for example, cellar apartments; previous diseases). This should be introduced in the lower schools, but in mentally backward children it should also be established by the Wassermann test of the blood whether there is hereditary syphilis, which, according to many contributions by Dr. von Leppmann,² of the insane asylum at Daldorf, occurs very frequently in such cases. In case Wassermann test should be positive, it would be advisable to employ an antisiphilitic treatment, but, at any rate, iodine syrup, codliver oil, etc., should be administered.

In such biological record charts should be noted everything concerning changes during the years of puberty as well as the

² Leppmann, Ueber die Beziehungen der Idiotie zur Syphilis, Deutsche Zeitschrift für Nervenheilkunde, Bd. xxxix, S. 81.

further development of the pupils. I think that the testing of the sensory organs and of the intelligence would also have the great advantage that striking abilities would be at once recognized, and further cultivated and developed. It would also considerably facilitate the grouping of the children as very gifted, mediocre, and weak. It would also be found out whether the pupil is lacking in diligence or ability. By saving the results of such tests entered on the biological charts and by continuous current additions to them, the school would be in a position to aid the parents materially in selecting a life vocation for the pupils. From the results of tests of the sensory organs and other manifestations of the pupils, such as preferences for certain subjects, the sharp eye of the teacher would be able to discover for what future vocation the pupil may be best fitted, and these special abilities may be nursed in school. In this way the school would best fulfil its true object: to prepare the pupils for life.

CHAPTER LVI.

THE OBLIGATORY TRAINING IN ART NEEDLEWORK AND MANUAL TRAINING.

OF all the criticisms which are advanced against the present-day high-school course, the most deserving one is that the pupils enter life filled with theoretical knowledge, but entirely unpractical. They have learned a good many theoretical things in school, but have gained little of practical value; they are often entirely uninformed in regard to the simplest facts of practical life, just because the practical sense, as well as the exercise of the sensory organs, has been neglected during their long, almost entirely theoretical, instruction. It is no wonder that the officers instructing those entering the one-year voluntary military service in the army are often heard to complain of how unskilled some of the young men are, coming from the high schools, heavily laden with theoretical knowledge, in contrast with the recruits coming from the laboring classes. This is caused by the fact that those young men have exercised their sense-organs, and also their hands much less than the young men who have had a manual trade. The latter are, therefore, often, to a certain degree, superior as far as training and skillfulness are concerned. To remedy this condition, particularly in our eminently practical time, it is necessary that everyone, no matter how high his position or profession, should possess a certain degree of business ability. The word "business" in English is applied not only to commercial transactions, but is also applicable to all callings; and it is just as becoming to the statesman and the diplomat as to the smallest merchant, if they, who are actually managing the transactions of a large community, are capable "business men." To manifest such business ability it is necessary, above all else, to have common sense, great experience in practical matters, and all perceptions must be sharpened, which

is indeed indispensable in our processes of thought. Only then are we able to think practically, and just as in rational thinking pass from the concrete to the abstract, from the known to the unknown, and thus build all our higher combinations of thought and our conclusive opinions. The most important and fundamental thing in this connection is that the functions of the organs of the sense should be perfect, and these should be sharpened, beginning in childhood. Children, therefore, at the age of 4 or 5 should undertake such games as have been introduced by Dr. Maria Montessori,¹ and which could be made more complete in various directions; and a great advantage here would be that the children could thus learn the elements of knowledge, writing, reading and arithmetic while playing, without wasting so much of their valuable mental capital. In this way the practical sense would be awakened by itself in the child. If a child has practised these exercises with his hands, which are sharpening its senses, it gains in manual training and skill. These should be followed, at the age of 6 or 7, by the regular manual training instruction, whereby the most varied objects could be modelled in clay or plastilin from life or patterns, according to the capability of the children. By selecting these objects from the animal or plant kingdoms, it would be possible to give the children instructions also in these subjects. Considering the fact that nature drives children, as well as young animals, to play, it would really be a crime against the children to disturb them in their innocent plays; on the contrary, we must encourage them to play, and utilize that instinct for the purpose of instruction. As long as children are in the playing age, all branches of instruction should be taught them during their play. Herewith it would be possible at the same time to avoid the injurious stiff sitting on the school-benches, which is diametrically opposed to the child's nature and unnatural besides. If, as we see at present, the modern tendency to return to nature is applied to all things, to our mode of life, feeding and dressing,

¹ *Selbstätige Erziehung.* Stuttgart, 1913.

I can see no reason why we should not follow the same in rational education.

The hands of the children, their fingers which are constantly in motion, demand activity, and this alone calls aloud for instruction in manual training. Hereby the senses are enormously sharpened, and the senses of color and proportion are acquired. This is of particular importance, because in this way the ability to size up things in a practical way is strengthened. We have already mentioned how essential this is in promoting rational thinking. By sharpening the sensory organs and developing the practical sense we have found the right way of developing the child's intelligence. The instruction in arts and crafts (which has been introduced into many schools in Germany and Austria, and its general introduction is urgently needed) could be utilized also for teaching the children to make various useful objects in wood and other material. In this manner the way for instruction in the various manual trades would be paved. The selection of the latter could be made according to the aptness shown during the games, because during these the disposition of the individual is best manifested. Teachers should not exercise any influence at all upon the children in selecting their games; the child itself should select the game which appeals to it the most. Considering the fact that there is no "compulsion" in this regard, talents for various things and vocations could be recognized in the small child and further developed. Just the same as in the games for exercising the senses should the child also select the arts and crafts which it wishes to learn, in which case the teacher naturally could assist by advising, but there should be no commanding or compelling. The results of the instructions in arts and crafts could also serve very well as an indicator in this connection.

At least one year, and in the case of some trades even more, should be reserved for such manual trade-school training. At any rate, one should, for hygienic reasons, avoid keeping young people on the school-bench for such an extended period, which

at present covers thirteen to fourteen years, and to which from five to six years of university training are often added. Of the eight to nine years of high schooling and the seven years of elementary schooling, one year could readily be devoted to manual training and one year to trade schooling, or, at least, six months could be devoted to each.

It would be best if the theoretical instruction were withheld until after the completion of these practical years, during which the most varied subjects would be taught by example anyway, and then joined therewith. I have mentioned before that it would be most rational if practical instruction came first in everything and theoretical instruction followed, not as is now the universal practice, to give children the tiresome theoretical instruction first and practical instruction afterward.² Practical thinking should come first; after that, theoretical.

Instruction in the trades is also eminently useful, in that those who have received such training are not compelled to beg, if for any reason they are thrown on their own resources either because of inadaptability to study or because of misfortunes in practical life. Knowledge of a trade would protect them from the most bitter want. Efficient tradesmen are always able to find their bread. In the rearing of girls it would also be of advantage if they were taught some useful, money-making business in their childhood or youth. In the homes of the various rulers there is a tradition that the various members of royal families learn some trade. In our stirring times nothing stands on sure feet, and there is also rattling at the thrones. One can be robbed of his physical belongings, but not of what is carried in his head. Of all possessions, the things which a man has learned—that which he knows—is the surest aid to his advancement.

Of the various forms of manual work, gardening and farming are to be recommended, first of all. This kind of work

¹ See the chapter about studying foreign languages.

would be particularly useful today, because of the unholy desertion of agricultural workers from the home-like soil to the factories in the larger cities. It would be a great blessing if the growing up children would spend their time in the open air, and thereby develop better mentally and physically. The love of nature would thereby also be fostered to the best advantage among them.

CHAPTER LVII.

THE NECESSITY OF OUTDOOR SCHOOLS.

WE can observe in animals that their young have a peculiar instinct which compels them to be continually in motion. Young dogs or young cats do not keep quiet for a minute; they jump around constantly, and play the whole day; their parents let them do as they please, and even participate in their play.

The human young also presents no exception from that general rule; the impulse to move around is born with them; only the old of the "homo sapiens" are not so sensible as dog or cat mothers, and they try as much as possible to restrain that impulse to motion. This continual motion brings about a better blood-circulation, promotes the metabolism which is so great in children and contributes greatly to their development. If they have that desire to play in the free air, their health is very much benefited by it. We thus see, therefore, how it is against nature when children and growing young people of both sexes have to spend the most sunny hours every day sitting straight in the damp, bad air of the often overcrowded classrooms. And this, moreover, during the years of their growth and development when they, just like a young plant, a young tree which is yet to grow, need the most oxygen and most sunshine. We designate our era over and over again as the century of enlightenment; we see everywhere attempts to arrange our living conditions as hygienically as possible, and even the State takes an active part in it. It is, therefore, quite remarkable that, like as if we did not see the forest for the trees, we have not come to see yet that it must be very unhealthy when a child, or a young boy, or girl during puberty has to spend five to six hours daily in the damp school-air, and after that two to three hours at home with school-lessons. What do we not do to combat tuberculosis, and at the same time how irrational is it to attempt to destroy entirely the

bacilli, and at the same time permit the children to inhale them in the classrooms overfilled with bad air? A change for the better could here be accomplished if the schoolhouses (also gymnasias) were so built that each schoolhouse had a large yard in which a garden could be planted, and as soon as the temperature of the air reached 15° teaching were done outdoors, and after every half-hour of instruction fifteen minutes' play-recess were given. Such outdoor schools could be established near the cities during the summer, beginning in May, in favorable weather, in the field, park or in the woods.

The ideal thing would be, of course, such country school homes as are established by Dr. Lietz, where the pupils receive instruction also in manual training, garden, and field work. As in this way the physical health is best developed, it would have very favorable influence upon mental progress. It is only to be regretted that the high cost of living in such homes does not permit their general acceptance.

CHAPTER LVIII.

INJURY CAUSED BY EXAMINATIONS, FROM THE HYGIENIC STANDPOINT, PARTICULARLY OF THE EXAMI- NATION FOR GGADUATION.

IF a person is living constantly in fear and care, this has a very bad effect upon the condition of his body and mind. That the power of his mental activity may hereby suffer very materially is, after all that we have said in this book, surely to be assumed. It will, therefore, be so much harder for such an individual to undergo great mental strain, because through the constant ideas of fear his attention is deviated from the subject, and this weakens his power for taking notice of things. Such is the position of those much to be pitied young men who look forward to the difficult trials of the examinations for graduation. One may be prepared ever so well, and yet not be able to get rid of the thought that some unforeseen accident may happen which could play a bad trick on him. With the examination it is very frequently the same as with a trial before court. One may be ever so positive of winning the trial, and yet there is always the possibility that the capable lawyer of the opposite side may shoot off some trick just when presence of mind is wanted. And it is just that condition of the nervous system, that mental state, upon which most everything depends in an examination. Many, also most able candidates are tortured with doubts, and if one has the misfortune to come from a family predisposed to nervousness, these doubts may take such proportions that grave mental disturbances may follow. It may even happen in such cases that, in families in which mental diseases do occur, the outbreak of such a disease is promoted. But even in young people, who were well-balanced before, and not at all nervous, the excitement and strain may lead to neurasthenia. In young girl students, the number of which daily increases, it may come

to hysteria, particularly if there is a congenital disposition. At any rate, during the months before the so-much-feared examinations for graduation the young folks are working very hard; they lose their appetite and cannot sleep; during this time the foundation is often laid for nervousness and for nervous diseases in general in previously entirely healthy individuals. The much-worried parents and all the rest of the family also suffer with them. The greatest danger lies in the fact that all these injuries strike the young people at a critical time, because the youthful body is still in the period of development. And when the matter is examined more closely it can be found that the examination for high-school graduation is, properly speaking, not an arrangement which could not be dropped. It is just as useless as examinations for establishing the degree of knowledge in general are. If anyone passed an examination well, it only goes to prove that he was at a certain time able to answer some questions well, or, in the best case, that he was prepared at a certain time in one subject; very frequently, however, it shows that he had much luck. One could, moreover, swear that 85 per cent. of what has been learned for graduation will very soon evaporate, which is entirely natural. We have already said that a man remembers only what he has often recalled into his memory. But, honestly speaking, how much of all that stuff, which has been learned in bloody sweat, is of any need in future life? And what a person knows later in life he has not learned in school, but by diligent private studying. Moreover, no one thinks of defending the crazy idea that the examination for high-school graduation is intended for the purpose of learning useful knowledge needed in later life. This examination is not only useless, but superfluous. When a teacher has had a pupil under his observation for years, and often quizzed him, every sensible man would naturally think that the teacher should be able to judge of the extent of that pupil's knowledge. Nothing betrays the mental state of a person so much as a composition written by him. If, then, a pupil has written compositions for years, the school faculty,

unless it is struck with blindness, should know whether the pupil is mentally mature or not. Wherefore, then, is it necessary to play that doleful comedy of examination for graduation! At the present time, when in all domains there is aroused the spirit of rationalism, when everywhere there is introduced hygienic arrangements, not only to heal diseases, but to prevent them, it is certainly astonishing that the State supports with its authority such institutions which depress so greatly the body and mind of the flower of the nation upon which its future depends and injures its health so badly. Where the struggle for existence is so bitter in that extraordinary contest that it is possible to stand it only by straining all available strength, a man needs very much, first of all, a healthy body, sound nerves, and a healthy mind. And in this respect the examination for graduation is, for most pupils, simply criminal.

When the military authorities introduced the requirement of an examination for admission as a one-year volunteer it was guided by the desire to get into the service as soldiers more intelligent material. It is most probable that the same end could be obtained without this examination, which often injures the intelligence very badly. What is mostly needed in military service is the faultless use of the sensory organs, and I am very much in doubt whether the preparation for the difficult examination is apt to sharpen these senses particularly. I am rather more inclined to think that it is liable to do much harm in that respect. That the intelligence of the pupils is particularly improved by these examinations can hardly be assumed when it is considered that the great majority of the pupils manage to acquire the greater part of the extensive knowledge required only by grinding. And surely nobody would seriously defend the idea that this is likely to improve the intelligence. It is certain, however, that the examination is liable to injure very badly the ingenious disposition which is so rarely found in children. The whole plan of the gymnasium is indeed so arranged and has for its main object to pass well all that is required in the

examination for graduation. Now, it is a fact that in a number of subjects is required not a merely superficial knowledge, but a considerably thorough one. (That much of this has absolutely no value for practical life is very well known, generally.) If, therefore, a child has particular gifts for some subjects, and only, as is frequently the case, very moderate or insufficient ones for others, it necessarily has to strain its mental faculties so much more, because the arrangement of the curriculum cannot be changed. As a result the children are liable to an injury to their nervous system, a breakdown from which they will suffer all their lives. At any rate, it is liable to kill an ingenious disposition in its very origin.

If those two Prussian professors who, at the end of the eighteenth century, introduced the miserable graduation examination could only have anticipated how much mischief they brought upon the flower of the whole German nation, how many suicides they have caused, and if they knew how many thousands of families curse the institution which they introduced, they would surely turn in their graves.

The meaning of the gymnasium is supposed to be, as the word itself signifies, a school for exercises. It should develop the talents, it should find out the whole inborn potentiality of the child; should discover it, stimulate it, and unfold it. As the matter stands at present, the gymnasium, with its well-established curriculum, by means of which a single common level is established, without taking into consideration the congenital disposition given by nature, can only cultivate drumming-in and plugging. It can only bring into the university a very mediocre element which went through the mill undamaged, but cannot bring the fatherland any geniuses. Is it not a rather startling fact that after the final examinations (*abiturientenexamen*) were introduced the classical writers almost died out in Germany? Germany had its great philosophers and classics at a time *before* the introduction of these examinations! Hardly any single one of the *great* classics had taken his final examination in the gym-

nasium. *There are also children of genius born today, but their individuality is destroyed by an institution which puts them all on the same level, and ignores the elementary law that every man possesses a different potentiality.*

CHAPTER LIX.

THE NECESSITY OF EDUCATING INGENIOUS CHILDREN OF THE POOR AT THE STATE'S EXPENSE.

AMONG the many thousand children who go to school, those with ingenious dispositions are very rare. Everything which is of value in the world is rare. This general law in the world's economy is undoubtedly in the interest of mankind, to stimulate the striving for what is of value. Many thousands of musselshells have to be opened to find a single pearl, and when among thousands of children *one* child of genius is found, it must also be considered as a valuable pearl. The ingeniousness in it must be well taken care of, so that it will not perish; it must be found out early enough and an attempt must be made to remove all obstacles in its way.

Many perils menace the ingenious child of poor parents. Insufficient feeding, as we have already considered, may narrow down his mental faculties. In a badly nourished body the mind cannot well develop, and lack of proper food often leads to the development of disease, which prevents mental development, and, in addition, very often a disagreeable domestic condition is found, as the result of poverty. Sometimes potentialities of genius are found among illegitimate children, as is seen from the fact that a number of great men were of that kind; for instance, the great scientist, Erasmus of Rotterdam, the son of a servant-girl, who used to say of himself that he "was not the fruit of a monotonous matrimony." So, also, was the great artist Leonardo da Vinci. The great mathematician D'Alembert was found as an illegitimate child set out on the steps of the Church St. Jean le Rond, in Paris. It would be a crime against all mankind if ingeniously disposed children were left to perish, because the whole of humanity is under obligation to men of genius and their discoveries. And just now, when we live in the time of

mediocrity (one of the reasons for it we mentioned in chapter ix, 5), such rare plants should be fostered and well taken care of.

How hard poverty presses upon such children and obstructs their further development, or makes it entirely impossible, we learn from a number of examples. Hebbel had to suffer great deprivations during his childhood and youth, and these have weighed heavily upon his mental productions like a black cloud. I would be the last not to recognize the great value of poverty as a stimulation of ambition and industriousness, because I had experience of it myself during my student days, and have appreciated it as a helping factor in this, as well as in my other book. It is, however, certain that the poor, ingenious young men are prevented, just on account of their poverty, from devoting themselves entirely to their favorite occupation, to their studies, because they must at the same time earn a living for themselves. As I had to do tutoring since my boyhood days to support myself, and had to pursue my studying at the university under the same condition, I know myself how little time there is then left over to follow favorite studies! Such distractions as cares of life surely very often may (but not always must) have an unfavorable effect upon a congenitally ingenious disposition. It must further be taken into consideration that, as Jean Paul Richter so strikingly said:—

“While it is true that want is the mother of arts, it is also true that at the same time it is the grandmother of vice.”

I would lay particularly great stress on this danger faced by early-matured, ingenious children if they happen to get in the wrong environment. Just as such children are liable to mature into great men under proper guidance, so there is a danger that under the influence of forced want and bad example they may develop into great criminals. This statement is supported by examples which are not rare. Emile Deschanel is undoubtedly entirely right when, in his *“Physiologie des Ecrivains,”* he advances the assumption that it is possible to say of a man what

and who he is, if it is known what his environment was during his youth and how he was brought up.

Such ingenious children must, therefore, first of all, be removed from the endangering environment. And it must be the sacred duty of the State to find out such precious stones, to maintain them, and have them educated for the common welfare. It means to cut out of the rough precious stone a glistening diamond.

Illegitimate children are very often born under better eugenic conditions than the offspring of lawfully married parents. They are often the fruit of a love affair, and the conditions of free sexual selection are here better kept than in lawful marriages, where social position and wealth are often the only deciding factors. I must express here my regret that the State is so near-sighted as to allow extraordinary good human material to go to ruin by permitting that children born in the foundling asylums should be brought to the country and given to peasant foster-mothers. There they often enough perish in poverty and misery, die very early, or, as if in revenge for the miserliness of the State, become criminals and alcoholics, and thus cause the State damage a hundredfold. Would the State, which keeps a controlling eye on the peasants' horses, so as to be in a position to requisition them in case of war, permit such a blundering with the horses' colts as is the case with its most precious good, the human child?

If the State were a good business man it would make a selection among these children, would have them thoroughly examined, would also have their mothers examined, and when the condition of the body and mind is found intact, would take such children under its own control, put them in specially outfitted institutions, would foster and take good care of them, and bring them up to become useful citizens of the State. It would further attend to it that the authorities should be informed of every case of a child with ingenious gifts. This could be done by the teachers in the kindergartens where a well-manifested talent

can be discovered by the sensory exercises according to Montessori system, or by the teachers of the public schools. At the entrance examinations for the gymnasium, a State committee should be present, and in case the intelligence test, which we have before suggested, should show a striking ingenious ability, and the parents are very poor, the State should take over such children for education. Gifted poor children should, at any rate, be freed from all school fees and books and other school paraphernalia given to them by the State. The same care should be taken of ingenious university students. Unfortunately, the State resources are not sufficient for such purposes. The necessity of supporting a large army does not permit the State such expenses, and, therefore, private benefactors should take a hand in it. It is hardly possible to think of any more charitable purpose than making it possible to maintain and educate poor, ingenious children, to make serviceable to all mankind the powers slumbering in them. The production of a genius benefits not only small communities, but the whole of humanity. Considering the fact that nobody can take his money along with him into the grave, it were a very noble deed if wealthy testators would found legacies for such purposes. Many a man may have committed during his life something wrong against his fellow-man for which he would like to atone before he dies. It is well to remember an old saying, which I saw engraved on a centuries-old altarstone on exhibition in the courtyard of the municipal building at Eger. It read: "Secret donations pacify the Lord's anger." Gifts made on the death-bed will surely not be counted for less! To support by all possible means a poor, ambitious boy endowed with the gifts of a genius should constitute the duty of every fair-thinking man in general! It is lamentable that so many poor students of great talents at the university should perish in poverty and misery because there is nobody to give them a lift. There are foundations for so many charitable purposes, but none for perfecting poor, ingenious children. Such a foundation is, therefore, urgently needed. If we look over the ranks of the

great, ingenious men through centuries we would only rarely find one who had to suffer deprivation and go hungry during his youth. It is remarkable that most of these men, except probably the artists, come from the middle class or from the higher, wealthy class. Only a few of the world's famous geniuses came of poor parents, and even these (I want to emphasize this particularly) had not suffered want. Napoleon's mother was very poor and blessed with children, but he was educated in the military academy at the State expense, and thus was at least free of the cares of life. The greatest botanist of the world, Linné, to whom the present state of botany and probably part of zoölogy is due, would have surely amounted to nothing if the physician, Dr. Rothmann, in Vexsio, in Smaland, had not discovered his ingenious gift, had not educated him himself, and helped him to the university. If it had not been for that philanthropist, Linné would have been lost to science. Because he did not get along in Latin and, therefore, could not become a theologian, his father put him as an apprentice to a shoemaker. Dr. Rothmann has done a great favor, not only to Sweden, but to the whole world. Unfortunately, however, our sober, cold times lack men like Rothmann. Also Kepler, one of the greatest astronomers of the world, would have become a cowherd, if his grandfather had not gotten for him a free scholarship in the monastery school at Hischan, because he was not fit to be a soldier—which was the intention of his father, who was a corporal in Wurtemberg—on account of his weakness. Throughout his whole life this great man, who was persecuted by his coreligionists because he stood up for the introduction of the calendar improved by the Pope, Gregory VIII, was pursued by want and misery, and thus Kästner could justly say about him:—

“No mortal had ever climbed so high
As Kepler rose, and died in starvation.
He only knew how to amuse the *minds*;
So the *bodies* left him without bread.”

CHAPTER LX.

BIOGRAPHIES OF GREAT MEN AS AN OBLIGATORY SUBJECT OF INSTRUCTION IN OUR SCHOOLS.

THE object of the high school is not to drum in *much exact knowledge in all the branches*. It should rather awaken the desire to study and by all possible means stimulate the pupils to greater application in that subject to which they intend to devote themselves in future life. Pupils can be spurred on to greater diligence by being given examples of how some children rose from modest circumstances and by iron diligence and perseverance became famous men. The inborn talent is not all that is needed, for only by great diligence can a genius become developed. One may come into the world with potential ingenuity, but a genius must not only have the inborn power of imagination, but also much power of judgment. Considering that the latter has to be acquired, it is obvious that much studying is necessary; one must see and hear much to gain as much experience as possible, and then utilize this experience in forming conclusions.

What is genius, first of all, but iron diligence and perseverance, full devotion to the subject with which one is engaged, penetrating deep into it, highest concentration to one point. Mozart was such a genius, and even during his childhood he demonstrated that he never applied himself to anything only halfway, but devoted himself to it body and soul. When the little Mozart learned arithmetic, all tables, chairs, walls, and even the floors in the house were covered with figures written with chalk. When Isaac Newton was asked how he made his discoveries, he answered: "By continuously thinking of them." As a model of the many great men, who distinguished themselves by their diligence and perseverance we may mention Alexander

von Humboldt, who had the habit for many years of getting up in the morning at 4 o'clock and working until late at night. Euler was so diligent that for almost twenty-five years he published a mathematical contribution every week. And the great Dutch physician, Swammerdam, worked for six years over the anatomy of the frog.

Buffon, the great naturalist, according to his own statement, spent fifty years at his desk and filled thirty-six large quarto volumes with his knowledge. According to Buffon, genius is nothing else but "longue [much] patience," and it is to this patient searching and inquiry that most geniuses owe the discoveries and inventions which made them world-famous. This we see, for instance, in the founder of protective vaccination against smallpox, Edward Jenner, who later became Sir Edward. He was a plain apprentice to a surgeon in Sudbury, near Bristol, when, in the course of a conversation, a girl made the remark that she was not afraid of smallpox because she had already had the cowpox. This remark struck Jenner, and he thought over it a long time, the idea keeping him busy continually, so that his colleagues laughed at him for his obsession. For twenty-five years he collected evidence on this point, until he was certain about the matter, and had vaccinated his own son three times without any bad results. Then he came out publicly with a paper, but he was mocked at. Those in high positions made a laughing-stock of this unknown country physician, and it was only after enduring much opposition that his idea conquered the whole world, saving innumerable people from the terrible disease of blackpox. In addition to being created a knight, Jenner's discovery brought him national gifts of 10,000 and 20,000 pounds, and, what is worth still more than all the money, his name became immortal as the discoverer of cowpox vaccination and as a benefactor of humanity. Geniuses are not often so fortunate as Jenner, but must often enough travel a hard road. When they announce a discovery, first it is ignored, then it is laughed at, and then, again, opposed. At last it is recognized, but in that

case priority is denied to them. Only after they have died in misery and have been dead perhaps one hundred years *thankful posterity* erects a monument to their memory!

The biographies of the great traveller Livingstone, and of the great inventor Stephenson, could also serve the children as brilliant examples of great diligence, and at the same time stimulate poor pupils to persevere in spite of poverty, in the hope that by their diligence and never-ceasing patience they will some day reach an honorable position in life, and may acquire for themselves a name to be praised by men of all nations. To such poor young men the present offers only suffering and deprivation; one should, therefore, give them sunrays of hope for the future, and incite their courage and diligence. Hope for a better future could be awakened in so many despondent young men in their gloomy days—hope for a better future—by relating some of the singularly brilliant examples in the world's history. So, for instance, the life-history of Napoleon, whose mother and sisters lived in such deep poverty in Marseilles that they had to do washing for others, and who, out of deepest poverty, by his high intelligence and energy, rose to be a ruler of the powerful rich. One could also call attention to the example of some of his marshals, such as Bernadotte, or to Abraham Lincoln, who, from a poor boy, became the president of the greatest republic in the world.

Attention could be called to great men in all domains; to great thinkers, philosophers, inventors, composers, painters, great physicians, and, to be entirely modern, to great business men, who, as self-made men, have worked themselves up by their diligence and ability from poor boys to highly respected positions. A special textbook should be written containing the life-histories of these great men, and the professor of history or literature should lecture about it one or two hours every week. An inspiring, beautiful lecture would be of highest educational value, and by enumerating the noble features which are so often encountered in great men the inner perfection of the pupils could

be promoted. One of the main objects of the school is indeed supposed to be education, and the bringing of the pupils up to an ideal way of thinking and to prevent them from becoming cold materialists. The life-histories of so many ingenious men, who, by their work and activity, by their discoveries and inventions, became the benefactors of mankind, could serve as good examples. The work of a true genius is due to the impulse within him, and not to the prospective remuneration. Geniuses are driven to their accomplishments by an inner impulse of which they are themselves unconscious. A genius is, as we have already seen, an idealist. There can hardly be any higher object of the middle schools than to develop in the pupils an ideal nucleus, to make of them altruists; and to this end the study of biographies of many great men can contribute very materially. In this way they receive an inner support which protects them in all changes of life, and supports them in bad hours of temptation from deviating from the right track. Genius represents the highest intelligence, and at the same time it is the highest idealism; highest intelligence and highest idealism are consequently paired together. If, however, with highest intelligence is associated ideal thinking, altruism is the result. An altruistic individual, on the other hand, cannot commit any crime unless he has lost his mind. A criminal is, indeed, as a rule, a real materialist. I may, therefore, justly put high intelligence and crime in contrast to one another, because an unintelligent man is kept away from bad deeds by the thought of the bad consequences to which they may lead. Spinoza was right when he said: "Vices are errors of the mind."

From all that has been said, it follows that the development of intelligence by means of school education protects against crime, and, on the other hand, that crimes are performed most frequently by those of low intelligence, by idiots, the feeble-minded of various grades, and alcoholics. They lack two barriers against crime:—

1. Will-power.

2. Intelligence (contemplation of all possible consequences of crime).

Considering that in many pupils, even when of better lineage, there is always a possibility of the presence of a hereditary foundation for a tendency to do something bad, it should be worked against by the study of noble characters which would help to form a noble spirit. By the good effect of examples of the great diligence of these men, the inclination to idleness, one of the main causes of crime, would be eliminated. The old Dutch Vater Katz was perfectly right in saying that idleness is the mother of sin and the stepmother of virtue. An altruistic education would, therefore, be promoted by obligatory instruction in biographies of great men, particularly if it would be shown by the examples that they have not been guided by selfishness, and could not be kept away from the right track by the mean ingratitude of their fellow-men. Their examples teach us in general how often they were denied worldly goods, and also the recognition of their fellow-men for whom they had sacrificed themselves. Bechstein was perfectly right in complaining that *laurel crowns are only plaited around dead scalps*. And in our short, earthly life it amounts to very little whether the seed sprouts in a few years or after a generation, if only many generations of men are benefited by it. It would be the greatest benefit of an altruistic education if the pupils could be taught that it should be the highest aim of man so to live that the name left after death would be honored by everybody; that good deeds never remain without reward, but that the inner joy and satisfaction over a good deed which one was privileged to do is a sufficient one.

Steadfastness could also be mentioned during the instruction in such principles and maxims. The never-shaken courage of many great men, and Shakespeare's expression that "he who does not dare to climb the shaking ladder, should continue to crawl courageously upon the floor," must act inspiringly. Such men are truly not lacking in the history of the world. For heroic

INDEX.

- Abelard, 88.
Absent-mindedness, 297, 381.
Abyssinians, 225.
Acetic acid, 31.
Aceton, 31, 49.
Acromegaly, 30, 68, 158.
Addison's disease, 31.
Adenoids, 46, 208.
Adrenal, 31.
Adrenalin, 139.
Agbard, 80.
Age, influence upon intelligence, 74.
Albertone, 28.
Alcohol, 7, 113, 115, 191.
Alt and Hoppe, 188.
Altitude, 212.
Ammonia, 134, 227.
Ampère, 201, 300, 396, 399, 409.
Amyl nitrate, 227.
Anemia, 109.
Antipyrin, 136.
Apathy, 249.
Arabs, 225.
Arago, 20, 402.
Archimedes, 269.
Aristotle, 4, 400.
Arteriosclerosis, 75, 133, 155, 203, 229.
Art needlework, training in, 422.
Aschaffenburg, 141.
Ascher, 36.
Aspirin, 226.
Aztecs, 302.
- Bach, 70.
Bacon, 201, 394, 397, 399.
Baldwin, 166.
Basedow's disease, 25, 48, 126, 170.
Basks, 302.
Baudelaire, 275.
Bechstein, 443.
Bedard, 37.
Bedouins, 225.
- Beethoven, 70, 78, 204.
Berger, 79, 208.
Bernhardt, Sarah, 99.
Bermouille, 399.
Bethe, 249.
Binet, 326, 419.
Binswanger, 187.
Biographies, as an obligatory study, 439.
Bleeding, for headache, 134.
Bloch, 95.
Blood circulation, in the brain, 1, 6, 10, 12.
 in fainting, 12.
 in fever, 1.
 in headache, 133.
 in thinking, 4, 8, 13.
 improvement of, 202.
Blood, albumin, 60.
 formation, 36, 213.
 loss of, 8.
 pressure, 13, 229.
 viscosity of, 13.
Blum, 35.
Bodman, 248.
Boerhaave, 194, 197, 202, 403.
Bolton, 11, 243, 251.
Bolyai, 300.
Bonheur, Rosa, 99, 104.
Bonhoeffer, 120.
Brain, cortex of, 248.
 fatigue, 140.
 white and gray substance, 248.
Braun, 42.
Bridgemann, Laura, 268.
Bromides, effect of, 9, 227.
Bruno, 281.
Bruns, 206.
Byron, 195.
- Cajal, 251.
Calcium, 232.

- Campbell, 254.
 Carbohydrates, 360.
 Carbonic acid bath, 169.
 Carlyle, 194, 275.
 Castration, influence of, 20.
 Charcot, 12.
 Children, school education of, 111.
 Chlorosis, 109.
 Cirrhosis of the liver, 34.
 Clavius, 411.
 Climacterium, 21.
 Climate, influence upon thinking, 62.
 Coffee, 7, 228.
 Common sense, 263.
 Comparative method, 370.
 Compulsion in education, 366.
 Condorcet, 300.
 Congestion to the eyes, 133.
 Constipation, 110.
 Copernicus, 396.
 Corday, Charlotte, 5.
 Cramer, 418.
 Crantz, 57.
 Cretinism, 23, 178.
 Criticism, 85.
 Cromwell, 316.
 Curriculum, in high schools, 412.
 Curschman, 96.
 Cuvier, 408.
 Cyon, 36.

 D'Alembert, 434.
 Dalch, 23.
 Darwin, 58, 71, 283.
 Davidenko, 206.
 Davos, 217.
 Davy Humphry, 196, 396, 401, 407, 409.
 Decroly, 333.
 Degaud, 333.
 Dellatre, 216.
 Dementia paralytica, 156.
 præcox, 19.
 Demoor, 250.
 Depression, 10.
 Descartes, 6, 87, 194, 197, 201, 281, 324, 393, 395.
 Diabetes, 49.
 Diet, 203.

 Diligence, 381.
 Dizziness, 229.
 Donaldson, 253.
 Dream, 7, 256.
 Drinking-water, as cause of goiter, 183.
 Drugs, 226.
 Ductless glands, factors in inheritance, 67.
 causes of intelligence, 265.
 influence upon thinking, 16.
 Dullness, organotherapeutics in, 374.
 Dunoyer, 101.
 Dürig, 239.
 Dute, 99.
 Duval, 289.
 Dwight, 245.

 Ebert, 325.
 Edinger, 287.
 Edmunds, 28.
 Education, object of, 321.
 mental, of children, 364.
 Ehrlich, 231.
 Eiselberg, 25.
 Eliot, 104.
 Emotion, 6.
 Engadin, 219.
 Eosinophiles in senile dementia, 33.
 Epilepsy, 186.
 Eppinger, 27.
 Erasmus, 281, 403, 434.
 Erb, 216.
 Esquimaux, 59.
 Ethiopians, 302.
 Euler, 141, 201, 295.
 Exaltation, 10.
 manaical, 2, 3.
 Excursions, value of, 372.
 Extract of animal organs, 372.

 Falton, 29.
 Faltz, 36.
 Faradey, 201, 384, 396, 409.
 Fassin, 37.
 Fever, effect upon mentality, 1.
 effect upon brain cortex, 1.
 Fischer, 333.
 Flatau, 137.

- Flechsig, 253.
 Food, for mental workers, 356.
 for musicians, 361.
 for school-children, 389.
 Foreign languages, studying of, 347,
 414.
 as a means to develop intelligence,
 354.
 Forgetting, 318.
 Fournier, 146.
 Frank, 3.
 Franklin, 87.
 Frauenhofer, 41.
 Frederick the Great, 210.
 Frohme and Hoppe, 188.
 Fürbinger, 96.

 Gaertner, 225.
 Galileo, 87, 395, 406.
 Gall, 293.
 Galton, 70.
 Galvani, 65, 200.
 Garnier, 37, 231.
 Gauss, 201, 395.
 Geniuses, 64.
 Gibbon, 6, 283.
 Gibson, 31.
 Gladstone, 76.
 Goethe, 85, 275, 409.
 Goiter, 181.
 Goldoni, 195.
 Golgi, 251, 290.
 Goltz, 242.
 Grammar, study of, 349.
 Graphology, 257.
 Great men who were sickly children,
 393.
 who were eager readers, 398.
 who were bad pupils, 406.
 Groszlich, 245.
 Guye, 46, 209, 386.

 Habits, treatment of bad, 320.
 Hagenbeck, 364.
 Haig, 57.
 Haller, 201, 379, 393, 397, 399, 403.
 Hausemann, 245.
 Haydn, 70.
 Headache, 42, 229.

 Headache, influence upon thinking,
 132.
 Hebbel, 365, 435.
 Hegel, 164, 210.
 Hekoten, 216.
 Helmholtz, 395, 396, 401, 406.
 Helmont, 281, 285.
 Henri, 326.
 Herder, 283.
 Hereditary predisposition, 10.
 Heredity, influence upon thinking, 67.
 Herschel, 71, 395.
 Hertoghe, 26, 176, 234, 377, 387.
 Hugens, 396.
 Humboldt, Alexander, 283, 332, 395,
 397.
 Hygienic means, 190.
 Hyperthyroiditis, 26.
 Hypothyroiditis, 27, 48, 157.
 Hyrtl, 5, 206, 336.
 Hysteria, 161.

 Impulses, controlling of, 320.
 Inflammation, influence upon mental-
 ity, 9.
 Insanity, causes and prevention, 105.
 Insomnia, disturbing memory, 313.
 Instincts, 323.
 Instruction, rational, 335.
 Intelligence, signs of, 265.
 Iodine, 153, 229.

 Jaurigg, 55, 181, 237, 366.
 Jaueregg, 55, 181, 237, 366.
 Jenner, 440.

 Kafeman, 46.
 Kant, 47, 65, 86, 210, 275, 339, 341,
 384, 395, 397, 409.
 Karo, 168.
 Kästner, 395.
 Katz, 443.
 Keller, Helen, 268.
 Kepler, 201.
 Key and Ketzins, 41.
 Klapproth, 406.
 Kobler, 69.
 Koch, Robert, 397.
 Kocher, 54.

- Korsakow's disease, 150.
 Kowalewska, 246, 407.
 Kraepelin, 120, 141.
 Kramer, 325.

 Lagny, 300.
 Laguer, 216.
 Laignel, 33.
 Laplace, 395.
 Lautz, 67.
 Lavater, 266.
 Laziness, 381.
 Learning, compulsory, 326.
 methods of, 329.
 influence of age upon, 331.
 Lecithin, 54.
 Lecturing, rational, 335.
 Lehmann, 143, 294.
 Leibnitz, 6, 87, 194, 201, 281, 339.
 Lenau, 148.
 Lepine, 289.
 401, 409.
 Leppmann, 420.
 Leysin, 212.
 Leuwenhock, 12.
 Liebig, 401, 406.
 Lietz, 372, 428.
 Light, influence of, 218.
 Lime metabolism, 15, 52.
 Lincoln, 399, 441.
 Linné, 194, 281, 396, 410.
 Livingstone, 441.
 Localization in the brain, 253.
 Locke, 194, 197, 281, 369, 394, 397, 411.
 Loisel, 93.
 Lombroso, 66, 69, 219, 272, 291.
 Longevity of great men, 393.
 Lorand, 1, 29, 33, 35, 41, 48, 50, 67,
 98, 116, 126, 157, 171, 202, 215,
 217, 228, 237.
 Loyola, Ignatius, 143.
 Lugaro, 34.

 Mahommed, 283.
 Makart, 148.
 Malgat, 216.
 Malpighi, 12, 65.
 Manual training, 422.
 Marcé, 2.

 Mark, 31.
 Marriage, 112.
 Masturbation, 95.
 Mayer, Robert, 283, 407.
 Memory, 263.
 associative, 299.
 conditions required for, 294.
 cytological basis of, 249, 287.
 dependence on circulation in the
 brain, 290, 310.
 facilitating, 313.
 importance of thyroid for, 312.
 mechanism of, 286.
 recitative, 293.
 scharp fixation for, 304.
 systematic development of, 286.
 weak, 307.
 Mendel, 190.
 Meran, 217.
 Metabolism, 48.
 Meumann, 325, 332.
 Meyer, 115.
 Meynert, 12.
 Meyerbeer, 282.
 Migraine, influence upon thinking,
 132.
 Milton, 65.
 Mingazzini, 92.
 Moebius, 86, 148, 165, 245.
 Moltke, 77.
 Monakow, 242, 245.
 Monge, 395, 396.
 Munk, 252.
 Montessori, 261, 277, 371, 418, 423.
 Morte, 130.
 Morel, 2.
 Motl, 68.
 Morphium, effects of, 9.
 Mozart, 70, 73, 78, 196, 396, 439.
 Müller, 214.
 Myxedema, 25, 126, 157, 173, 387.

 Napoleon, 47, 72, 196, 210, 275, 411,
 438.
 Nasal chambers, influence upon cir-
 culation in the brain, 39.
 bleeding, 40, 133.
 secretion, 42, 134.
 Nathusius, 401.

- Nerve cells, 11.
 Nervousness, 161.
 Neuburg, 247.
 Neurasthenia, 95, 161.
 Newton, 197, 265, 268, 275, 339, 394,
 395, 397, 411, 439.
 Nietzsche, 148, 257, 308.
 Nitroglycerin, 139.
 Nizza, 217, 233.
 Noorden, 27, 109.

 Obesity, endogenic, 48.
 Oliver, 36.
 Onanism, 89, 92.
 Open air, 205.
 Oppenheim, 162.
 Osteomalacia, 53.
 Overstrain, mental, 140.

 Pascal, 78, 87, 201, 395, 399, 404.
 Pasteur, 201.
 Peck, 168.
 Perez, 82.
 Perrando, 25.
 Peters, 70.
 Petrarca, 285.
 Phagocytosis, 37.
 Phantasia, 64, 85.
 Phenacetin, 136.
 Phosphorus metabolism, 15, 35, 52.
 Physiognomy, science of, 231, 266.
 Pick, 206.
 Piler, 37.
 Pineles, 29, 33.
 Plinius, 403.
 Plönnies, 312.
 Pope, 394.
 Potassium iodide, 45.
 Progressive paralysis, 138, 146.
 Proportion, perception of, 259.
 Punishment, 111, 364.
 Pyramidin, 136.

 Querton, 250.
 Quincey, 305.
 Quinine, 139.

 Rabl-Rückhardt, 289.
 Rachael, 99.

 Radosawljewitsch, 333.
 Rallstone, 246.
 Ranke, 12.
 Raphael, 99.
 Rauschburg, 313.
 Reading, advantage of much, 398.
 Recreation, 144.
 Reddy, 372.
 Regand, 92.
 Rembrandt, 73, 99.
 Reschnikow, 206.
 Retzins, 245.
 Rheumatism, 221.
 Ribot, 305, 308.
 Richter, 215.
 Riviera, 217, 223.
 Roger, 37, 75.
 Rosenow, 216.
 Rossini, 6.
 Romberg, 230.
 Rothmann, 438.
 Rousseau, 2, 86, 95, 204, 282, 384, 409.
 Rudinger, 29.
 Ruediger, 216.
 Rush, 305.
 Ruysch, 12.

 Salicylates, 136, 226.
 Salust, 76.
 Salvarsan, 153.
 Sand, 104.
 Sanderson, 268.
 Sano, 45.
 Santa Barbara, 217.
 San Remo, 217.
 Savage, 50.
 Schaefer, 36.
 Scheer, 28, 52.
 Schiller, 6.
 School, injury caused by examina-
 tions, 199, 313.
 outdoor, 427.
 Schopenhauer, 275, 396.
 Schrumpf, 215, 218.
 Schultze, Max, 289.
 Schuhmann, 148.
 Scotoma, 132, 227.
 Seasickness, 135.
 Sense organs, impressions upon, 256.

- Sense, hypersensitiveness, 266.
 hyposensitiveness, 266.
 necessity of examination before
 entering school, 417.
 Senses, exercising of, 274, 277.
 oversensitiveness of, 275.
 education of, 279.
 Sexual characters, secondary, 18.
 Sexual organs, 16, 20.
 influence upon mentality, 21, 97.
 maturity, 83.
 impulses influencing the, 84.
 depressed, 92.
 differences, 84, 97.
 Shakespeare, 85, 195, 443.
 Silberhuber, 37.
 Silvestri, 56.
 Sleepiness, 125.
 Sleeping remedies, 1, 129.
 sickness, 126, 156.
 Sleeplessness, 125.
 Slowzoff, 54.
 Smoking, 230.
 Sneezing powder, 135, 211.
 Snuffing powder, 41, 44, 47, 210.
 Spalanzani, 65.
 Spencer, Herbert, 291.
 Spielman, 37.
 Spinoza, 87, 193, 395, 442.
 Stenson, 11.
 Stephenson, 441.
 Stephanowska, 249.
 Stepanoff, 37.
 St. Moritz, 217.
 Strohmayer, 379.
 Sunshine, 183, 204.
 Sun treatment, 216, 221.
 Sven Hedin, 195.
 Swammerdam, 403, 440.
 Sweat bath, 224.
 Swedenborg, 194, 247.
 Syphilis, 113, 147, 191.

 Tabes, 138, 155.
 Tachycardia, 31.
 Taine, 309.
 Tanzi, 289.
 Taste, good, 258.
 Tatar mountains, 223.

 Tatra-Fuered, 217.
 Tatra-Lomnitz, 217.
 Tea, 7, 228.
 Teaching, success of, 341.
 Tegner, 444.
 Textbooks, use of, 327.
 writing of, 344.
 Thinking, seat of, 242.
 rational, 256.
 Thyroid gland, 11, 22, 129, 170, 174,
 179, 213, 230, 377, 387.
 inactivity of, 24.
 removal of, 28.
 extract of, 142, 159, 166, 215.
 treatment, 237.
 Tissot, 2.
 Tizian, 72.
 Tizzoni, 28.
 Tobacco, 193.
 Torri, 37.
 Tossati, 56.
 Trachewsky, 54.
 Travelling, as exercise for senses,
 281.
 Troussseau, 310.
 Trypanosomiasis, 157.
 Tuberculosis, 221.
 Twain, Mark, 345.
 Tyge Brahe, 407.
 Tyrol, 223.

 Uric acid, as cause of mental dull-
 ness, 15.
 Uremic attack, 34.

 Van Gehuchten, 342.
 Van Valsem, 246.
 Velasquez, 99.
 Venesection, 134.
 Verworn, 289.
 Vibratory massage of the nose, 42,
 136.
 of the pharynx, 136.
 Vieussens, 39, 41.
 Virtue, 98.
 Vishi, 35.
 Volta, 200.
 Voltaire, 47, 282.

- Wagner, 37, 225, 245, 282.
Wallis, 57, 247.
Walter Scott, 265, 410.
Wassermann reaction, 106, 148.
Watt, James, 300, 393, 397, 409.
Weber, 226, 344.
Whitewell, 28.
Will-power, 322.
Winkler, 243.
Winslow, 4, 305, 310.
Witzel, 375.
- Wolf, 248.
Women, in art and science, 99,
rational education of, 103.
- Young, Thomas, 300.
- Zarniko, 39.
Ziegler, 249, 287, 289
Zieten, 143, 243, 419.
Zuntz, 214.

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