with the recovery from other influences, is an entirely new field of inquiry, and one deserving of thorough investigation in the present advancing state of experimental medicine as applied to the treatment of mental disease, and is a question which could not, perhaps, be settled by the statistics of any single institution, but only by observations extending over a long series of years. The evidence, however, obtained in this Asylum, and founded on nearly 200 recoveries, certainly gives the strongest support to the opinion above expressed of the happy influences of medical treatment. It is undoubted that the cases recovered by such means have had a duration of more than a month less, at least, than those calculated as attributable to mere residence, hygienic conditions, withdrawal from exciting causes, or the influence of mere moral discipline; and, such being the case, it can easily be understood how the curtailment of the destructive influences of mania, or the equally destructive loss of tone in melancholia, may be followed by the best results. and give an assurance of permanency in recovery which cannot be anticipated when the disease is more prolonged.

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2. *German Retrospect.*

I. *Recent Progress in the Histology, Physiology, and Pathology of the Central Nervous System.* By William Stirling, D.Sc.C.M., M.D., Demonstrator of Practical Physiology in the University of Edinburgh.

On Thermal Influences proceeding from the Hemispheres of the Cerebrum (Vaso-motor apparatus of the Cerebrum).—Drs. Eulenburg and Landois ("Centralblatt," No. 15, 1876) operated on dogs, and they found that young animals were specially well suited for their purpose. The estimation of the temperature was taken thermo-electrically by means of a Meissner-Meyerstein's electro-galvanometer. As thermo-electrical elements, two varnished Dutrochet needles were employed. After opening the skull and exposing the surface of the brain, the grey matter was destroyed by means of red-hot copper wires to the depth of 1-1½ m.m. The animals were kept deeply under chloroform. When a certain portion of the brain was to be stimulated, the animal was curarised, and the brain was stimulated by induction shocks, two fine platinum wires serving as electrodes. The chief results were the following :—

I.—Destruction of certain regions of the anterior lobes of the brain, corresponding to the temporal region, caused at once a considerable increase of the temperature in both contro-lateral extremities. The increase of temperature occurred immediately after the complete destruction of the corresponding parts of the surface of the brain, often before the animal awoke from the chloroform and before it made

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any spontaneous movement. The increase immediately after the operation may be 5-7°C, in other cases only 1½-2°C.

II.—The thermal areas for the anterior and posterior extremities are separated from each other. The area for the fore foot lies somewhat more anteriorly, and somewhat external, close to the lateral end of the sulcus cruciatus. Destruction of the super-sylvian gyrus has no thermal effects.

III.—In successful cases, after the animal awakened from the chloroform, there was generally disturbance of motion, and it seems that the portions of the surface of the brain which have this thermal action must lie in the neighbourhood of the corresponding motor areas.

IV.—The increase of the temperature is in nearly all cases clearly pronounced for a long time after the injury, sometimes even for three weeks; generally, however, it returns to the normal on the second or third day. Localized electrical stimulation of the above areas, with sufficiently weak currents, is accompanied by a small and temporary diminution of temperature (0·2-0·6°C) in the contro-lateral extremities.

The authors are of opinion that these facts justify the conclusion that there is a vaso-motor apparatus in the grey matter of the brain, and that it partly represents the central terminations of the vaso-motor nerves which run in the pedunculus cerebri.

On the Functions of the Cerebral Hemispheres. C. Carville and H. Duret ("Archiv. de Physiolog.," 1875, p. 352, and "Centralblatt," No. 52).—The first part of this very extended research contains an historical review and criticism of the experiments hitherto made on the function of individual parts of the brain. The authors reject entirely, and with justice, too, the results of the experiments of Fournié (obtained by injecting chloride of zinc into the brain of the living animal). Even the results of Nothnagel's experiments they discard (dilute chromic acid).

The second part of the paper is devoted to an experimental criticism of the results of Hitzig and Ferrier: the idea of Schiff that the movements caused by stimulation of the surface of the brain are reflex, the authors regard as not supported by fact. They cite experiments performed on living and dead brains to shew that on a certain point of the surface of the brain localized currents extend both laterally and in depth. Two platinum needles connected with a very sensitive galvanometer were placed on the surface of the brain, or pressed several m.m. into it. On applying weak induction currents to certain parts of the surface of the brain, the galvanometer needle was more or less deflected. Nevertheless, a localized action of the current is to be assumed, in as far as stimulation of parts of the surface of the brain discharges different and quite distinct movements, when only weak currents are employed—a fact already sufficiently pointed out by Hitzig. With regard to the action of anæsthetics, the authors agree on the whole with Hitzig. A further series of experiments is given to

shew that the integrity of the grey matter is not necessary for the occurrence of circumscribed movements, experiments which were performed in a similar manner by Braun and Putnam. The experiments are new which prove that complete extirpation of the corpus striatum does not hinder the occurrence of movements on stimulation of the surface of the brain, and that distinct bundles of the centrum Vieussenii conduct the excitement from the brain to the periphery. Further, some results of Ferrier are corrected which were obtained by employing too strong a current. The extirpation experiments do not shew anything new. The authors come to the conclusion that the cortical centres are replaced after their destruction in the grey matter of the same hemisphere.

Further experiments are connected with elucidation of the functions of the corpus striatum and optic thalamus. Concerning the latter the authors confirm the experiments of Ferrier, according to whom electrical stimulation of these structures does not cause either pain or movement. In studying the function of the corpus striatum, one must specially bear in mind the nucl. caudatus and the corpus lenticulare. Electrical stimulation of the nucl. caud. yielded the authors the same results as Ferrier, viz., contraction of all the muscles on the opposite half of the body; complete extirpation caused a great weakening of the opposite half of the body (frequently falling to one side), and a movement in a circle in which the animal always executed the same movements with the sound feet, and rotated around the affected ones like a top. On injuring the internal capsule complete paralysis of both extremities of the other side occurs. This occurs upon injuring the first two-thirds of the anterior portion, which lies immediately under the ventricular surface of the nucl. caud. Section above the same produces only incomplete hemiplegia. Destruction of the posterior part of the capsula interna (between thal. op. and nucl. lentic.) produces hemi-anæsthesia of the opposite half of the body.

The authors from their experiments attempt to locate the probable position of the different centres in the cortex of the brain in man thus: The centres for the different movements of the upper and lower extremities lie in the middle of both upper posterior central convolutions, in the middle of the anterior central convolutions, and in the whole of the upper temporal lobes.

The centres for the movements of the neck and head lie in the posterior part of the first frontal convolution, where they unite with the anterior central one.

The most probable centre for the muscles of expression and eyelids lies at the place of junction of the second frontal convolution with the anterior central one.

The centres for the movements of the tongue, jaw, and lips are found placed in the third frontal convolution (Broca).

Single centres for the movements of the eyeballs are placed, accord-

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ing to Ferrier, in the gyrus angularis. The first tempero-sphenoidal convolution has probably a relation to the organ of hearing.

Lastly, the authors give a series of experiments which have a pathological importance; coma occurs most easily in extensive hæmorrhage into the centrum semiovale; perhaps with hæmorrhage on the convexity, and specially of the frontal lobes. If an intra-ventricular hæmorrhage stimulates the ependyma of the ventricle, tetanic convulsions of the extremities of the opposite sides of the body result. With hæmorrhage at the base, stretching towards the medulla, the phenomena of general tetanus are always to be observed at the moment of the attack.

On the Effects produced by Electrical Excitation of the Brain. Bochefontaine ("Gaz. Méd.," No. 35, 1875) stimulated, by means of an electrical current, the frontal convolution in front of the sulcus cruciatus, where it bends round the sulcus. The result was contraction of the spleen, of the small and large intestine, of the bladder, dilatation of the pupil, hyper-secretion of the submaxillary gland. If the submaxillary gland is separated from all its nervous connections, except the sympathetic fibres which pass to it, if the above part of the brain is stimulated, thick saliva flows from the canula, but in a much smaller amount than when the connection with the seventh nerve is intact. The same occurs during death by asphyxia, the poisoned blood acts like stimulation of the brain on the sympathetic fibres.

On the Influence of the Excitation of the Brain on the Beats of the Heart. Lépine ("Gas. des hôp.," No. 90, 1875) found that stimulation of the surface of the most anterior part of the cerebrum influenced the heart beats of the dog. If the *left* vagus was divided in a curarised dog and the *right* surface of the brain was stimulated, the number of heart beats was unchanged; if the left side, on the contrary, was stimulated, the number of heart beats was diminished, and the height of the pulse sank.

Syphilitic Disease of the Cerebral Arteries. O. Heubner (Leipzig, 1874. 8vo. pp. 238. Four plates. "Centralblatt," No. 22, 1875).—The spot in which syphilitic disease of the cerebral arteries most commonly occurs is the non-vascular part of the artery which lies immediately below the endothelium within the fenestrated membrane. At first several nuclei appear here imbedded in a finely granular matrix; then long spindle-shaped cells appear which, according to the author, do not arise from the vessels, but are developed from neighbouring parts, especially the endothelium; further development occurs partly by the increasing division of the pre-existing cells, partly by the further apposition of the proliferating layer of endothelium. The cellular proliferation always constitutes the greater part of the new mass, the inter-cellular substance the less; gradually the endothelial covering is raised from the fenestrated membrane, but almost always unilaterally; sometimes this occurs in so localised a fashion that actual tumours project into the lumen of the artery. In the mean-

time the proliferation increases, spindle cells are applied to spindle cells, and the lumen of the artery becomes narrower and narrower. The cells begin by close apposition to form a thick layer. Sometimes flat cells and giant cells appear, accidentally, round cells are to be seen, which wander in from without and appear to favour the nutrition of the new growth. The narrowing of the lumen becomes always more pronounced and leads at different places to thrombosis. The new formation begins to be organized and to undergo involution. In the first case a sort of vascularization is formed by the new formation of capillaries in the peripheral parts of the tumour, and a complete newly-formed fenestrated membrane appears under the endothelium in all probability proceeding from the latter. The whole new formation becomes differentiated into two layers, an inner one consisting of compressed giant cells, and an outer one of connective tissue formation. It is as if a new vascular wall was formed in the old artery such as we see at other places, *e.g.*, bones where syphilis leads to a genuine new formation of tissue by proliferation. In opposition to this process of organization in other cases *retrogressive* changes are observed. The new-formed tissue becomes poorer in cells, the inter-cellular substance becomes changed into fibrous connective tissue, and cicatricial contraction occurs, which lead to narrowing of the tubes. In fact, the vessel may become changed into a thin thread of connective tissue, which ultimately is torn asunder, so that complete obliteration of the organ occurs.

This syphilitic affection of the arteries is quite distinct from the atheromatous processes. The latter process always lasts many years, even, perhaps, tens of years, whilst in the syphilitic affection considerable disease of the intima leading to occlusion may develop in a few months. Further, the character of the atheromatous processes is not that of a new formation, but that of a genuine hypertrophy. There is only an increase of that tissue of which the intima consists. All further changes are of a retrogressive nature, such as fatty degeneration and calcification. The two diseases are quite different in their origin, result, and anatomical condition. Of course an atheromatous process may occur in the arteries of a syphilitic person. This occurs like atheroma, almost only in old persons, whilst the degeneration of the cerebral vessels in young individuals results from syphilitic new formation.

In the following chapter the author treats of the *physiological importance of the syphilitic arterial affection*. The normal circulation in the cerebral arteries is fully discussed. In as far as the importance of the syphilitic disease of the arteries depends essentially on the closure or narrowing of the lumen of the vessel, the action of this latter process is specially considered. By occlusion of an artery, a variation in pressure occurs in the cortex, and thus is explained the sudden loss of consciousness, apoplectic attacks, syncope, &c.; but as the circulation in the cortex is soon again restored, so the effect is only temporary.

Much more important, however, is the action of occlusion of the artery on the basal area supplied by it; for the vessels, according to the author's investigation, are actual terminal vessels in Cohnheim's sense. We observe that here partly by infarcts, and partly by softening, deep lesions of the brain-substance and corresponding loss of the cerebral functions occur. For the most part, as the great ganglia are chiefly affected, we have to deal with motor disturbances, and with irreparable hemiplegia. As the closure of the vessels is generally sudden an apoplectic seizure is of frequent occurrence.

The effects of simple narrowing of the arteries are much more complicated. Here we have to deal with changes in the elasticity of the wall, caused by the appearance of new formations in it. The blood-current flows no longer in elastic, but in rigid tubes: thus, the movement of the blood in the network of the pia becomes slower, and consequently that in the whole cortex is affected. This leads to interference with the sensorium, &c. Here a gradual compensation may occur, and hence we see that such disturbances pass off.

The closing chapter consists of observations on the *pathology of the affection*. Etiologically it is of importance to notice that this disease occurs in the very latest stages of syphilis. The shortest time of its appearance after infection may be three years; once only half a year elapsed: then there occur cases where 4, 5, 12, and 20 years intervene. Only cases of pure disease of the arteries are taken into account. Generally the disease is extensively distributed, the anterior cerebral arteries being specially affected. Sex and age are quite irrelevant. The individuals were partly young (22), partly old (51). The symptoms are introduced by prodromal phenomena. Most commonly there is at first headache of great intensity, so that sleep is interfered with. Sometimes there was simple sleeplessness without headache; then vertigo occurred, and generally temporary disturbances of consciousness, a sort of epileptoid attack. The demeanour and temper are changed; intelligence and memory are temporarily weakened, and there are pronounced weakness and relaxation. Great excitability and often absent-mindedness sometimes precede the attacks.

The disease itself generally begins with an apoplectic attack, followed by an epileptic or semi-paralytic condition. At the moment of seizure the patient falls down unconscious, or there is only slight vertigo, nay, even sometimes no disturbance of consciousness at all. Paralysis of one side is one of the most common symptoms of syphilitic arterial disease. With few exceptions the cerebral nerves are free; generally the arm is most powerfully affected, and the leg somewhat less so. The course of the hemiplegia is constant when the fatal issue appears, soon thereafter. In cases of longer duration, it improves, and may even disappear. Unilateral contractions and unilateral pains were often observed, the former produced by the stimulation of the great ganglia.

The second chief group of phenomena is concerned with the effect

on the higher mental functions, *i.e.*, on the energies of the grey cortex; these disturbances occur in all cases. The characteristic thereof is the incompleteness of the severe phenomena.

Consciousness is affected, but not abolished; voluntary activity is impaired without all voluntary impulses disappearing; there is a condition in which the patient seems partly asleep, partly awake, and somewhat dreamy. Between delirium and delusion the understanding suddenly returns; speech becomes slow and stuttering; in some cases there is genuine aphasia; all these conditions may be completely healed after a time, and then reappear, such as occurs in no other disease of the brain; more rarely there are general convulsions, vomiting, fever.

The syphilitic indications are often found in other places in the form of gummata, ulcers of the skin, and affections of the mucous membrane. In other cases adenitis alone was present, or even no sign of syphilis. Death was sometimes accelerated by amyloid degeneration of internal organs.

Those cases in which the disease of the arteries is not pure, but is complicated with syphilitic new formations within the skull run a similar course, only here there are circumscribed paralysis of individual cranial nerves.

The duration of the disease varies greatly. Some cases were fatal in from 24 to 36 hours; others 1 to 3 weeks. Generally the disease lasted from 1 to 3 months, with specific treatment 6 months, even several years. The prognosis is always dubious: when coma occurs absolutely unfavourable; therapeutically energetic inunction and large doses of potassium iodide are indicated.

Experimental Investigations on the Simplest Psychical Processes.—S. Exner, Pflüger's Arch., vii., 601, viii, 526, xi., 403, and 581, and Centralblatt, 1874 and 1876.

The author's experiments relate to the time which is necessary "to react in a conscious manner to a sensory impression;" he calls this time the time of reaction ("Reactionszeit"). In order to measure this time the moment when a stimulus was felt, was indicated by means of the right hand depressing a board whose movements were written upon a revolving cylinder; the moment of stimulation was also indicated upon the cylinder. The author found that, as a rule, under conditions as nearly equal as possible, slow moving and studious individuals have the shortest time of reaction (the smallest value was 0.1295 sec.,) the stimulus being applied to the left hand. In order to obtain a short time of reaction, the greatest attention is necessary. The resulting contraction is then executed to a certain extent involuntarily. The sensorium is prepared by central changes for the reaction, and a certain time is required before these changes again disappear. Long-continued experimentation tends powerfully to exhaust one. If the stimulus is very strong, or if the sensation is new to the experimenter, the time of the reaction is very much shortened. The same

result is obtained if one is excited artificially, and then one reacts just like after a fright. The point of application of the stimulus is of very great influence. The sparks of light produced by passing an induction shock through the eye were constantly most rapidly replied to; from the right to the left hand more slowly than from the left to the right, and slowest of all when the toes of the left foot were stimulated. The time of reaction diminishes with the strength of the stimulus and with increased practice, and increases with fatigue. Tea and morphia had no effect; on the other hand, with a strong dose of wine the reaction was executed with unconsciously greater violence, and the time of reaction increased, whilst the experimenter believed that the opposite was the case.

The time of reaction, which in the author's experiments on different individuals varied from between 0,1295-0,9952 sec. [from the left to the right hand], yielded very constant results in the same individual, and is composed of several factors. The rapidity of the conduction in sensory and motor nerves, together with the time necessary for the discharge of the muscular contraction, are all known from the researches of previous authors. The shortest time of reaction with direct electrical stimulation of the retina, was not inconsiderably (0,0213 sec.) less than that by stimulation by means of the image of an electric spark. Nevertheless there are sources of error in these investigations, one of the most important being the impossibility of choosing stimuli of equal strength in comparative experiments. The sensory conduction of the spinal cord was estimated by comparing the time of reaction on stimulating the toes and stimulation of the fingers. The rapidity of the conduction is equal to 8 meters per sec., whilst the motor conduction—so calculated that at one time the signal was given with the hand at the other with the foot—gave a value of 11-15 meters. The time during which the centripetal excitation became converted into the centrifugal "the reduced time of reaction" was found to be equal to 0.0775-0.9426 secs. It determines the differences in times of reaction in different individuals and under different conditions.

In the above experiments, in which the reaction occurred after a momentary stimulus, the time of reaction indicates the error in the estimation of the time. It may be very nearly estimated in successive experiments (to 0.01 sec.) whether this error increases or diminishes. If a stimulus is applied to a sensory organ it does not act suddenly, but if we take care (*e. g.* in rhythmical stimuli whose succession can be easily learned, or in astronomical observations) to react so soon, that the moment of signaling coincides with the impression made on the organ of sense, the error is nothing, but the variations from this mean are very considerable. This agrees with the experience of astronomers that the "personal difference" becomes smaller when departing from the ordinary method, the *sudden disappearance* of a star is used as the moment of signaling.

In a second paper the author seeks to estimate the time which is necessary for the discharge of a reflex act. He selected the reflex time for marking, and produced this by a method fully detailed in the original, at one time by an electrical spark passed in front of the eye, at another by electrical stimulation of the fibres of the trigeminus. In the former case the reflex excitability was not only greater, but was subject to more considerable variations than the analogous time of reaction. In the latter case it was not inconsiderably smaller, but varied relatively more than the former. The reflex time became smaller with increase of the stimulus.

The author is also convinced that similar physiological processes are connected with the reflex and reactionary phenomena.

If strychnine is given to a frog, and its nervous system be stimulated by passing a slyte into it at different heights, then the contractions of the gastrocnimius whose movements are written on a revolving cylinder, follow after varying times. The time of reaction is greatest and tolerably constant on stimulating the cerebrum, and mid-brain; it becomes suddenly smaller after stimulation of the medulla oblongata, and with stimulation still further down it diminishes very gradually; again it becomes suddenly smaller on stimulating the point where the periphral nerve passes into the cord. From this the author concludes "that the result of a stimulus applied to the brain becomes accelerated in the cerebral ganglia, that after leaving these it traverses the spinal cord with considerable rapidity, and before it passes into the roots of the nerves it again suffers an acceleration.

Two successive stimuli acting upon an organ of sense, are only known not to be simultaneous when the time which elapses between the beginning of both does not fall below a certain limit. The cognisable difference in time between two such sensory impressions, the author characterises, are "the smallest difference." The smallest difference will vary according to whether the successive sensory impressions are applied to the organ of sense or to analogous elements of a paired organ of sense, or to elements of different sensory organs.

I. *Sense of Sight.*—The smallest difference on stimulating the same elements of the retina has been investigated by several authors. It amounts to about $\frac{1}{24}$ sec. from experiments on Plateau's discs; by electrical stimulation of the same fibres of the optic nerve this time is less than $\frac{1}{60}$ sec. The arrangement was so made that the central parts of the retina lay in the area of the greatest tension of the current. When the Neef's hammer of the induction machine made 60 vibrations per second, the impression of light was still not continuous. It is therefore obvious that the fibres of the optic nerve are less sluggish than the retina. In different elements of the retina the periphery conducts itself differently from the centre. Two points on the central part separated by 0.011 m.m. from each other, were stimulated by light from an electric spark, and the smallest difference was 0.044 sec. If the observer (Myope) removed to

such a distance that the two spheres of light around the sparks overlapped each other, the smallest difference with the same arrangement of the apparatus was only 0.015 sec., because in this case one obtained the impression of a movement, and the direction of such a movement is much more exactly recognised than the earlier occurrence of a spark.

The smallest difference is independent of the size of the pictures on the retina, of the distance from the retina, within certain limits, and also of the intensity of the light. For the peripheral part of the retina, with a certain distance between the pictures and the retina, an apparent movement was not to be avoided.

If the picture on the retina lay 3 m.m. above the other, as many below the forea centralis, the smallest difference was 0.055 sec., with lateral fixation 0.049 if one of the two signals was chosen as the fixed point, then the smallest difference between the centre of the retina and a point of the retina 6 m.m. removed therefrom, was = 0.076 sec.; if the observer fixed *with both eyes* the slit of a screen which was placed in front of the signals, and protected each eye from the spark, then the smallest difference = 0.017 sec. an apparent movement was noted.

II. *Hearing.*—Vibrations are intermissions which are made known to us by a group of sensory elements. Helmholtz says the vibrations between h ‴ and c ⁗ can still be heard, there are 132 per sec., the smallest difference would therefore be 0.0075 sec. In as far, however, as in this case, 16 partly very weak vibrations of the tympanum occur between two pauses, Exner imagines that the time during complete pauses might be still smaller. A Savart's wheel, with only three adjacent teeth, which struck a piece of sheet iron, was turned with a velocity which increased till the double stroke became converted into a single one. The smallest difference for two stimuli of short duration was reckoned from the rapidity as = .002 sec. The crackling of two electrical sparks was heard separately when more than .002 sec. separated them. The smallest difference for different elements of the same ear is less than 0.1 sec., because Helmholtz's quaver sounded quite well when 8 to 10 shocks per sec. were given. Exner imagines that here also a smallest difference varying essentially, would be found if the two tones were only once sounded. The smallest difference between the two ears is 0.064. Two elastic balloons were struck one after the other, by means of an elastic spring. These balloons were provided with tubes which, by means of an adapter accurately fitted the auditory meatus, both springs were discharged by means of a pendulum. With regard to the senses of touch, taste, and smell, the author refers to the researches of other observers.

Smallest difference between dissimilar organs of sense.—As the signal for the eye an electric spark was used, for the ear the sound from a bell; when a sensory impression affected the eye and the ear simultaneously, the auditory impression was sooner felt than the visual one. The smallest difference in Exner's case was 0 16 sec. When the

visual impression preceded the auditory one—from the opposite 0·06 secs.—the visual impression occurs even somewhat later than the sense of touch. In another communication the author shews that the material changes which are the cause of different visual impressions—*e.g.*, after-picture—do not take place in one and the same part of the optic apparatus. By electrical stimulation of the fibres of the optic nerve it can be shewn that the positive similarly coloured after-picture must occur in the retina, and indeed all after-pictures take place in the retina. The retina is divided into two sensory zones; to these a third zone must be added in order to explain the phenomenon of the electrical rays of light (Pourkinje), which one sees on observing a burning coal in the dark; this coincides anatomically with the layer of nerve fibres. The phenomenon itself, according to Exner, results from the passages of the excitation from one channel to another.

Changes in the Cerebral Vessels under the Influence of the External Application of Water.—M. Schüller ("Deutsch. Arch. f. Klin. Med." xiv. 566, and "Centralblatt," no. 36, 1875) trepanned the skull of rabbits, and found that an obstruction to the out-flow of venous blood, disturbance of the respiration, or pressure on the abdomen, produced strong injection of the pia mater. After section of the vagi this effect was not produced, on account of the preponderance of the inspiratory movements. Fear and pinching, generally produced narrowing of the vessels, sometimes after previous dilatation. Ice applied to the exposed dura mater produced marked narrowing of the vessels, which was much weaker on the side from which the cervical sympathetic and the ganglion supremum were excised. Cold applied to the abdomen produced an instantaneous dilatation of the vessels of the pia on the uninjured side, and generally no change upon the injured side. A moist, warm compress on the abdomen, on the contrary, produced narrowing, which was succeeded by dilatation upon the compress cooling. Complete immersion, as a general rule, acted like a compress. The injection of cold, and generally also of warm water into the rectum dilated the vessels. Packing with the wet sheet, whereby the animals became sleepy, was followed by a very temporary dilatation, which gradually passed into constriction. Similar results were obtained during opium-narcosis, but not by dry packing. Rubbing of the abdomen or back is accompanied with constriction or varying changes in the calibre of the vessels, but in a weaker degree when the sympathetic and the ganglion supremum are extirpated.

The changes above described occurred also in curarised animals, although in this case the filling of the vessels of the brain was somewhat less pronounced. After section of the sympathetic at the second vertebra, there is a pronounced dilatation of all the vessels of the pia mater, and the application of water was without any effect upon it. Cold directly applied to the freely exposed cutaneous sensory nervous trunks which issue upon the back produced constriction; heat, dilatation of the vessels of the pia mater on the same side. Section of

individual cutaneous nervous trunks was accompanied by a temporary dilatation of the vessels of the pia on the same side.

The blood-pressure in the carotid, from manometric observations, rose rapidly when cold water was applied to the abdomen, and then fell considerably; with warm water application it was just the reverse, with flat variations.

The occurrence of all these phenomena is explained by the author through the changes in the supply of blood to the vessels of the pia in consequence of a constriction or dilatation of the peripheral current-areas in the skin. The movements of the heart and respiration are only indirectly concerned in the result, at one time assisting at another hindering. The reflex influence of the thermal stimulation of the cutaneous nerves upon the vessels of the pia mater is, according to the author, of subsidiary importance, and acts rather in an inhibitory manner. The second phenomena which occur with long duration of the stimulus, and which are exactly opposite to the initial phenomena, may be explained by the changes in the conditions in the cutaneous vessels and their consequences.

From the results of his experiments the author draws the following conclusions regarding the therapeutical employment of different applications of water to the human organism. It produces (1) a restitution of the normal vascular tonus (especially of the brain); (2) the restoration of normal blood and lymph currents in the brain; (3) diminution of overfilling of the brain with blood; (4) the restoration of the normal nutrition of the nerve elements; and (5) of the normal reflex relation between the cutaneous nerves and the brain. In the insane a "methodical" water-treatment is for the most part not to be trusted, because one cannot say how far the resistance of the cerebral blood-vessels is to be depended upon.

Changes in the Brain in Traumatic Inflammation.—L. Popoff ("Virchow's Arch.," xiii, 421, and "Centralblatt," no. 38, 1875) under v. Rechlinghausen's direction examined the brains of twelve individuals who died of abdominal typhus. In all there were changes of an acute active inflammatory character in the vessels, in the neuroglia, and in the ganglionic cells. In the first of these, viz., the vessels, the cells in the walls, or the fat and pigment cells applied to them, were in a state of proliferation, in the neuroglia division of the nuclei, and in the ganglion cells both active proliferation processes and penetration of wandering cells. The former manifested themselves in division and increase in number of the nuclei, then in division of the protoplasm, whereby the individual parts either did or did not possess a nucleus. With regard to the occurrence of wandering cells it is to be remarked that they lay partly round the cells (in the so-called perivascular spaces) and partly also within the nerve cells, and by the penetration of such cells, division of ganglion cells is often brought about. In the preparation these wandering cells fell out of the ganglionic cells, so that these latter appeared as if perforated. Beyond being in and

around the ganglion cells these wandering cells were arranged in rows around the vessels, and here and there along the nerve fibres, but still preferably on the ganglionic cells.

Essentially the same changes are to be observed in inflammatory processes, and specially in traumatic inflammations, which were produced in a variety of ways upon dogs and rabbits, only here the active changes in the nerve elements were more pronounced; whilst in typhoid fever the penetration of the wandering cells was in full operation before the proliferation phenomena in the ganglion cells occurred, and in addition many granule cells appeared which were quite absent in the case of typhoid fever. Very interesting are the experiments in which the author injected colouring matters, specially China ink, into the brain. This curious result was obtained, that a short time after the injection the chief mass of the pigment lay in the ganglion cells, which had evidently taken it up by virtue of their own forces, as wandering cells containing pigment which could have accounted for the pigment were absent, and as nothing similar could be produced in dead brains. At this time granule cells were still absent, but they were present in large quantities, and enclosed the pigment, after the inflammation had lasted longer, whilst the pigment could not, or could only in a very slight degree, be detected in the nerve cells. The author concludes from this that the granule cells which generally occur in the brain in acute inflammation are (in part at least) changed nerve cells.

In another paper in the "Centralblatt" the author records these results of the examination of the brains of three patients who died of exanthematous typhus in the wards of Professor Botkin, of St. Petersburgh. In this disease also the author finds (1) That there is a similar collection of the wandering cells in the perivascular spaces such as occurs in abdominal typhus; (2) There is also penetration of the wandering cells into the ganglion cells, and division of nuclei in the latter; (3) Infiltration of the neuroglia with young wandering cells; (4) The proliferation phenomena in the walls of the vessels are more pronounced and extensive here than in ileo-typhus. Infiltration of fat and pigment in the vascular walls may also be observed. Capillary extravasations are sometimes to be noted; (5) An interesting, but at the same time very striking result is the formation in typhus, of small nodules in the substance of the brain. They were found in the cortical substance of the cerebrum, cerebellum, corpus striatum, etc., and were 0·105-0·18 millimètre long, and 0·075-0·09 millimètre broad; they often had a rounded form. These nodules with a low power presented appearances very similar to miliary tubercle. Like the latter they were found generally, though not always, next the vessels. With high powers (300 diameters) these nodules were seen to consist chiefly of indifferent newly formed elements which could not be distinguished from lymph-corpuscles or white blood-corpuscles. Sometimes they consisted of such corpuscles

alone, and this specially in the peripheral finely granular layers of the cerebrum and cerebellum. Where, however, in fibrous tissue nervous cellular elements were present in considerable proportions, as in other layers of the cerebrum, in the corpus striatum, other elements, nearly as large as the nuclei of the ganglion cells entered into their composition. The changes already described in the nerve-cells are often very pronounced around these nodules. In the first described form of nodule, consisting of indifferent elements like white blood-corpuscles, there is never a finely granular degeneration of the central part to be observed as is often seen in tubercle. Neither giant-cells nor a special stroma were to be observed. These nodules, from their character and origin, are apparently completely analogous to the nodules, described by Wagner as occurring in some parenchymatous organs, such as the liver and kidneys in abdominal typhus. These nodules were observed in two cases out of the three. The relation of these nodules to the brain-symptoms, owing to the epidemic being at an end, was not made out. In both cases the patient died on the fourteenth day ("Lond. Med. Recd.," 1873).

Physiology of the Cerebellum.—H. Nothnagel ("Centralblatt," No. 22, 1876), from a series of experiments on the cerebellum of rabbits, has arrived at the following conclusions:—(1) The cerebellum can be stimulated mechanically by a minimum puncture with a needle. (2) The motor phenomena can be discharged from different parts of the hemispheres and from its vermiform process. It is not necessary that the deeper parts adjoining the crura should be stimulated mechanically. (3) Mechanical stimulation of *one* hemisphere of the cerebellum produces motor phenomena first on the one and then on the other side of the body. The same is produced by injury to one side of the vermes; stimulation of the vermes in the middle line produces simultaneously motor phenomena on both sides. (4) One may remove (*a*) the greater part of one hemisphere, (*b*) greater part of both hemispheres, *i.e.*, with the exception of the direct continuation of the crura, (*c*) or the entire anterior and upper part of the vermes, and the animal may remain several days without shewing any symptoms thereof. (5) Destruction of a distinct portion of the vermes, however, produces intense continued motor disturbances which agree with those described by Flourens.

On Disease of the Brain. F. Karrer and C. Stark ("Berlin Klin. Wochenschr.," 1874, Nos. 31 and 33).—K.'s case relates to a strumous girl suffering from melancholy, who several months before her death had had spasmodic seizures without loss of consciousness. The spasms at first only affected the right arm, later the muscles of the neck on the left side, and ultimately passed into complete epileptic attacks with loss of consciousness. On post-mortem examination there was found tubercular meningitis, and in the posterior part of the left hemisphere a greenish-yellow coloured area 4½ c.m. long and nearer the middle line three or four similar nodules. The area affected

the surface of the gyrus occip. primus. Whilst the right hemisphere was quite free, there was a greyish-yellow coloured nodule the size of a pin's head on the margin of the left median frontal convolution. The partial spasms of the right arm, according to the author, were due to irritation of the cortex from the presence of the tumour in the posterior part of the brain, which physiological experiments, however, have not yet shewn to be motor in function.

In S.'s case continued contractions in the muscles supplied by the left facial nerve, and also in the masticatory muscles supplied by the motor branch of the fifth, occurred in a woman suffering from progressive paralysis. The extremities on the left side were only temporarily and very slightly affected, and only when the contractions of the facial muscles on the left side were very strong were the right side of the face and the right hand affected. Later a temporary lateral turning of both eyeballs towards the left, in which position they executed quick spasmodic movements from right to left. Post-mortem examination shewed several parts of the surface of the brain excavated into little pits; these pits represented cystic dilatations of the pia, and there the surface of the brain was irregular and atrophied. The author lays special weight upon a cyst lying in the upper part of the right sulcus præ-centralis, which compressed the root of the second frontal convolution and the lower part of the anterior central convolution; and by its gradual compre sion excited these parts, which, by the stimulation of the centres for the left facial nerve, the muscles of mastication on the left side and the straight muscles of the eyeball could have produced the symptoms described.

Aphorisms on the Pathological Anatomy of the Central Nervous System. R. Arndt ("Virchow's Arch.," 1874, lxi. 508-516).

I.—Pigmentary degeneration of the grey sheath of the nerve fibres in the intervetebral ganglia of a patient suffering from tabes.

II.—Tubercular degeneration of the grey sheath.

III.—Division of the axial cylinder.

IV.—Nerve fibres with nuclei.

The author has found nerve fibres in the brain, spinal cord, and spinal ganglia, whose axial cylinders contained oval nucleated and nucleolated structures. By embryological investigations he has convinced himself that normally, at a certain period of development, such structures occur not only in nerve fibres, but also in the processes of ganglionic cells, but that they ultimately disappear completely. He, therefore regards these nerve fibres as imperfectly developed, and as having remained at a lower stage of development, and having found the former only in the insane, the latter only in paralytics, he is inclined to seek the cause of congenital neuro- and psycho-pathic diathesis in this retardation of development.

On the Alterations of the Central Nervous System in a Case of Chorea, associated with Mental Aberration. C. Golgi ("Rivista Clinica," 1874), in the introduction, discourses on the different facts

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which appear to shew that chorea is of central origin. (1) Heredity of chorea. (2) Hereditary relations of chorea to other diseases of the nervous system. (3) Origin of chorea from psychical causes. In addition to these three causes there ought specially to be mentioned those cases of chorea in which psychical changes are added to the disturbances of motion; in fact, a survey of the literature shews that the greater number of pathologists ascribe a central origin to chorea. In most of the cases where a post-mortem examination was made, changes in the central nervous system were detected, but of so varied a nature that up to the present time no distinct relation between the chorea and any distinct anatomical nerve centre were detected. The case communicated by the author refers to a man who was born of an hysterical mother, and who died at the age of 42 of pneumonia. In his youth he had indulged much in baccho et venere; at the age of 32 chorea appeared, at first accompanied by maniacal excitement. In the first two or three years periods of complete remission, as well of the motor as of the psychical symptoms occurred; later the remissions disappeared altogether, and the disturbances of motion became chronic; at the same time a chronic condition of mental weakness, incapacity to follow regular instruction, difficulty in articulating words occurred. The year before his death furious delirium set in; the autopsy shewed the following:—A thick false membrane covered the whole of the right hemisphere, the pia mater was generally greatly thickened, the frontal and temporal convolutions were moderately atrophied; their ganglion cells were sclerotic, atrophied, or had undergone fatty-pigmentary degeneration. The ganglion cells of the corpora and the large ganglion cells of Purkinje of the cerebellum were calcareous; the posterior and lateral columns of the spinal cord shewed a secondary descending sclerosis.

In his critical observations the author refers to the great similarity between the pathological results of this case and the pathological anatomy of dementia paralytica. In this case also, just as in dementia paralytica, the interstitial connective tissue of the cortex was increased, whilst the ganglion cells had undergone degeneration. Specially noteworthy is the calcareous degeneration of Purkinje's cells; this has only once been described before by Roth. In the case of Golgi the fatty degeneration was not, as is usually the case, limited to one area, but it had a thoroughly diffuse character in as far as here and there single cells or even single processes of cells were affected.

On Epilepsy. Rinke ("Berlin Klin. Wochenschr," 1875, No. 37).—Rinke had a case where a soldier who had just recovered from typhus had epileptic seizures every evening. The author, by an experiment analogous to that of Brown-Séquard (stimulation of the skin of the neck in guinea pigs rendered epileptic), sought to produce attacks in his patient, which was successful when a stimulus, *e.g.*, mustard plaster, was applied to the skin between the

levator scapulæ and sterno-mastoid muscles. The experiment also succeeded when the patient, by the use of bromide of potassium, had remained for months free from spontaneous attacks.

On the Psychoses of the Pregnant and Puerperal Conditions.—C. Fürstner ("Arch. für Psych.," V.S. 505) observes that in pregnant women melancholy chiefly occurs, mostly running a simple and favourable course when occurring in the earlier months, of a severe and more protracted form in the later months of pregnancy. Of the puerperal psychoses melancholy proper is the principal form, mania the rarer. The author gives in both especially favourable prognoses; as to the question whether there is a special form of disease peculiar to pregnancy, the author answers in the affirmative. Its characteristic sign he regards as an acute, intense setting in of the first symptoms which in a few hours, and even in less time, may go on to complete delirium, accompanied by the most pronounced motor excitement. This delirious condition seldom lasts longer than three months; is characterized like its acute beginning by extremely pronounced sensory delusions, and then passes tolerably rapidly into a somewhat "stupid" stage. This latter description, however, only relates to the appearance presented by the patient. She takes notice of what surrounds her, motor impulses occurring quite suddenly which interrupt the stupid condition are to be explained by the sensory delusions. Convalesence often occurs very rapidly, corresponding to the disappearance of the sensory delusions. An abortive form of this disease, occurring quite as often when the first stage is only developed, lasts from six to eight weeks, not passing into the stupid stage but out into recovery. The prognoses of the complete as well as of the abortive form is generally favourable.

Transmission of Artificial Alterations to Two Generations.—E. Dupuy ("Gaz. Med.," No. 33, 1875) shewed the Society of Biology of Paris guinea pigs, which presented the peculiar changes in the medulla following section of the cervical sympathetic. These guinea pigs were the offspring of animals which had inherited this peculiarity from their parents originally operated on. Here, therefore, there was a transmission of an artifically produced condition to the second generation.

On Induced Somnambulism.—Ch. Richet ("Journ. de l'Anat.," 1875, p. 348) has made his experiments on about forty persons (including two men), and concludes—(1) That we can, by so-called "magnetic lines," as well as by fixing the attention on a shining object, and by other empirical but little known and unreliable procedures, produce a neurosis analogous to somnambulism. (2) This is with difficulty produced the first time, it generally appears when the process is repeated several times. If it has been once produced then it can be easily produced again. (3) All the phenomena to be thus observed may be explained by known physiological and psychological facts, and may be observed to a greater or less extent in some intoxications

(alcohol, chloroform, Hachisch), and in different nervous diseases (hysteria, epilepsy). (4) Specially characteristic are the phenomena of hallucinations, which can be produced, as often as one wishes, representing a complete automaton, so that the person affected is subject to the will of the experimenter, and feels sensations about which one speaks to him.

Development of the Corpus Callosum and Fornix.—Dr. V. v. Mihalkovics ("Centralblatt," No. 19, 1876).

Amyl-Nitrite.—Kelp ("Deutsch. Arch. F. Klin. Med.," xv., p. 602) has given this substance in doses of five drops two to four times daily to five patients (three men, two women) suffering from melancholia stupida, without having produced the slightest result on the psychical condition of the patients.

On a Case of Protopathic Spinal Muscular Atrophy.—Charcot and Gombault (Type Duchenne Avar, "Arch. de Physiol., etc.," 1875, No. 5) had an opportunity of observing a case of long-standing progressive muscular atrophy. The disease had, in the course of more than twelve years, led to the disappearance of the greater number of the muscles of the upper arm and shoulder in the patient, a woman of about 50 years of age. The lower limbs were tolerably well preserved. Their very complete investigation of the nervous and muscular systems yielded the following results:—The cerebrum, cerebellum, pons, and medulla oblongata with its nuclei were unchanged. The grey substance of the cervical and dorsal spinal cord was much changed, the degeneration gradually diminishing upwards and downwards from the lower part of the cervical enlargement. There the nerve cells and the nerve fibres which traverse the grey anterior horn in all directions had disappeared. The capillaries of these parts were enormously developed, the walls of the smallest and largest vessels thickened. The lumbar portion of the spinal cord and its lateral columns were normal; there was sclerosis of portions of the cord close to the exit of the anterior roots in the cervical and dorsal region. The ganglion cells occurring there were enormously diminished in size, without processes, more pigmented than normal, but still containing nucleus and nucleolus. The anterior roots of the cervical region were atrophied; sheaths either empty or often filled with large nuclei took the place of the normal fibrillar contents; the posterior roots appeared normal. In the peripheral nerves more than two thirds of the nerve tubes had disappeared; the greater number of the muscles of the shoulder girdle and upper extremity were atrophied; there was simple atrophy of the primitive bundles without coarser changes of the fibres, or any extraordinary development of the inter-fibrillar adipose tissue. The author proceeds from the stand point that the affection of the grey matter of the spinal cord is the primary part of the process in this disease, or, as he calls it, proto-pathic muscular atrophy or tephromyelitis.

Asymmetry of the Grey Matter of the Spinal Cord.—P. Schiefferdecker

("Arch. f. Micr. Anat.," xii., p. 87) has found that in perfectly healthy spinal cords, and without any functional disturbance being observed during life, a not inconsiderable asymmetry of both halves of the grey substance, both as regards form and position, may occur. The former case refers to a dog, the latter to a man. In both cases the asymmetry was distinctly limited to single vertebræ; in the dog to the region of the second cervical and the seventh dorsal, in man to that of the sixth cervical and the fourth to the sixth dorsal vertebræ.

Anastamoses of Nerve Cells in the Spinal Cord.—A. Willigk. Virchow's Arch., lxiv., p. 163, describes four cases of undoubted anastomosis of nerve-cells from a diseased spinal cord (Embolism). These were undoubtedly normal conditions, which, on account of the small amount of sclerosis of the inter-ganglionic substance, were easily detected.

On the Course of the Fibres in the Spinal Cord. P. Schiefferdecker ("Arch. f. Mikr. Anat.," x., 471.) arrives at the conclusion that the fibres of the spinal cord are so arranged that they serve to connect the different parts with one another in the most varied manner. For this purpose they pass partly out of the white substance in different ways into the grey, and partly become mixed with the latter in the most different manner.

Fibres which spring from different parts of the white substance go to the same part of the grey substance, or *vice versâ*. Fibres having a different destination, and which take origin in the same part of the white substance, pass in different ways into the grey, or pass at least into it at the same height. In the grey substance they form partly simple networks without ganglion cells, partly processes, which unite the different parts with each other, such as the anterior and posterior commissure.

On the Condition of the Nerve Cells in Embolism of the Spinal Cord. A. Willigk ("Prager Vierteljahrsschr," 1875, iii., s. 41).—In the neighbourhood of small, thickened sclerotic vessels of the spinal cord, plugged up by emboli, the author found in the grey substance pronounced proliferation of fine fibrillar connective tissue, rich in cells, in whose neighbourhood well-preserved ganglionic elements were scarce, their place being taken here and there by amorphous hyaline bodies, without nucleus or processes. Similar changes were exhibited by Clarke's column. The changes in the anterior horns, however, were most interesting; whilst the greatest number of their large multiplar cells presented throughout a normal appearance, there existed close beside them faintly glancing cells, whose body was only partly coloured by the carmine, and also completely colourless cells of enormous size, which, with a low power, appeared like masses of colloid matter, but which, under a high power, exhibited distinct processes and a pale nucleus. In the neighbourhood of such diseased cells, a thrombus of small vessels was generally to be found. The neighbouring tissue,

however, was unchanged, and exhibited no trace of proliferation of connective tissue. Here, therefore, in consequence of embolism, disease of several nerve-cells had occurred which may, perhaps, be regarded as genuine colloid degeneration.

On the Pathology of Sunstroke. K. Köster ("Berlin Klin Wochenschr," 1875, No. 34).—In the case of a soldier, who died from sunstroke, found the following appearances: Extravasation of blood into the ganglion supremum of the right cervical sympathetic; the ganglion was increased to about double its volume, its nerve fibres were separated one from the other and broken up; small hæmorrhages were found in the lower, larger ones in the upper part of the right sympathetic. In and around both vagi, in the sheaths of both phrenics, there were also extravasations, and at the lower part of the neck in both parotids there was hæmorrhage into the vascular sheaths; the brain was slightly hyperæmic; under the ependyma of the left ventricle there were several small ecchymoses; the lower lobe of the right lung was infiltrated with blood; ecchymoses were found under the peri- and sub-cardium of the left ventricle.

The author describes similar results as occurring in the case of a syphilitic woman where excessive increase of temperature could not have been the cause of death. The author makes future observers aware of the possible occurrence of disturbances of the vaso-motor and respiratory nerve centres which must occur in a pronounced form in patients suffering from sunstroke.

On the Pathology of the Cervical Sympathetic. P. Guttmann ("Berlin Klin. Wochenschr," 1875, No. 32) observed that in the case of a man of about 40 years of age, suffering from tubercle, the left half of the face and the neck became covered with sweat whenever he took even moderate bodily exercise. The left half of the face and specially the left ear became red, and the temperature in the left external auditory meatus rose several tenths of a degree above that in the right; atrophic disturbances were not observed on the left side, but they were clearly pronounced in the left eye, which was prominent, freely movable, while the conjunctiva was strongly injected, and tears sometimes flowed more readily from the left than from the right eye; the left pupil was wider than the right, but was sensitive to light; vision was normal.

This case is of interest, because of the abnormal secretion of sweat on one half of the face, and also because the phenomena are of a vaso-motor nature dependent upon the sympathetic and pointing to a paralysis of the corresponding fibres; whilst the occulo-pupilar phenomena must be regarded as the result of a stimulation of the corresponding fibres. The area of the left facial, trigeminus, and occulo-motorius (no disturbance of accommodation) was throughout intact; there was slight sensation on pressure in the region of the left cervical sympathetic, probably indicating a chronic inflammatory condition of this nerve trunk.