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SUPPLEMENT 23.

Psychiatric Investigation on a Series of Twins. *Essen-Möller, E.*

On the Relation between Schizophrenia, Epilepsy and Induced Convulsions.

This paper is concerned with investigating von Meduna's hypothesis that there is a biological antagonism between schizophrenia and epilepsy. Among 715 schizophrenic patients there were 20 who had convulsive attacks, and the diagnosis of epilepsy was taken to be established in five cases. Since this is twice the incidence to be expected by chance, it is assumed that the common factor in the original material, i.e. the cerebral process underlying the schizophrenia, also produced the epilepsy. A detailed account is given of eight patients with primary epilepsy who subsequently had schizophrenic psychosis. In five of these the two diseases persisted concurrently. In the remaining three the epilepsy gradually subsided, showing that the convulsive attacks were phenomena quite independent of the schizophrenia. Since there are great differences in the effect of spontaneous convulsive attacks and convulsions produced by cardiazol, the effect of cardiazol therapy in schizophrenic psychosis cannot be construed as supporting von Meduna's hypothesis.

R. K. MEISTER (Psychol. Abstr.).

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The Origin and Development of Nervous Disturbances Experimentally Produced.

The most striking features in this study have been the importance of the individual and the extension of the effects of the conflict for years after its original use as well as the extension to new systems later during the life of the dog.

The most important therapeutic indication is the detection of susceptible animals by measuring the reactions under strain, and preventing the progress of the strain to that point at which a

permanent breakdown occurs. Once the disturbance is thoroughly established, therapy is difficult. Improvement has been seen with a complete change of environment—removal to farm life for 18 months. Rest in the environment of conflict was unavailing.

(Author's abstr.).

Effect of Thyroid Medication on Brain Metabolism of Cretins.

Brain metabolism of cretins was studied before and after the administration of desiccated thyroid. Blood was collected from an artery and the internal jugular vein and analysed for oxygen. Cerebral blood flow was estimated with the aid of a thermostromuhr inserted in the internal jugular vein. The oxygen uptake was also determined and sustained an average rise of 22 per cent. after therapy, taking the premedication value as a base line. The deviations from standard values of basal metabolic rate are also presented. The average of 29 arterio-venous oxygen differences of 11 cretins was 5.74 volumes per cent. before thyroid administration, and that value was reduced to 4.69 volumes per cent. on 25 observations on 9 patients after therapy. In 8 cretins the average acceleration of cerebral blood flow was 57 per cent. Alterations of brain metabolism were determined by taking into consideration the changes of the arterio-venous oxygen difference and blood flow. An average increase of 32 per cent. in cerebral metabolism was thus revealed as a result of the administration of thyroid. This increase in cerebral metabolism affords a basis for alterations in the cerebral electrical potentials and psychological reactions of these patients. The electroencephalograms disclosed a rise of the energy level in certain frequency ranges. Psychologically, improvement was either absent or of questionable significance in any of the higher processes. The greatest change was that of an acceleration of psychological activity, an acceleration made possible by the increased energy expenditures stimulated by thyroid medication.

(Authors' abstr.)

Electroencephalographic Studies in Delinquent Behavior Problem Children.

(1) Electroencephalographic examinations were performed on 28 children who had been brought before the Domestic Relations Court of the City of New York.

(2) In 61 per cent. of the entire group the brain potentials suggested an underlying disorder in brain function. When only those with behaviour disorders were considered, 74 per cent. showed abnormal activity.

(3) These findings, which are similar to those found by other investigators, suggest the presence of an underlying cerebral disorder in a majority of children with severe behaviour disorders.

(Authors' abstr.)

Delinquency and the Electroencephalograph.

(1) Twenty boys committed to a state training school for delinquents were studied by the electroencephalographic method.

(2) Seventeen of these 20 have yielded abnormal records.

(3) Of the 17 abnormal records 3 suggested *petit mal* epilepsy, 3 showed irregularly abnormal patterns, and 11 showed a slow square-topped wave formation which the authors have called psychomotor-like.

(4) Some favorable results have been achieved in the treatment of a few of these patients with dilantin.

(Authors' abstr.)

A Study of Frontal Lobotomy.

(1) Twenty-two psychotic patients have been subjected to frontal lobotomy. Of 16 agitated depressions 12 recovered sufficiently to live in their own homes, and continue to live at home in a relatively satisfactory degree of emotional adjustment. Of the 5 advanced schizophrenics 2 have made apparent recoveries. Two have improved to some degree and one, after making only slight improvement, succumbed to a virulent lobar pneumonia. A case of sexual psychopathy, operated upon as a last resort, made no improvement.

(2) Two patients died; one was an anesthetic death and one was the result of post-operative hemorrhage. The mortality rate in general has not been a discouraging feature of frontal lobotomy.

(3) The operation should be employed only in chronic psychotic cases and only after other less drastic therapeutic methods have failed.

(4) The constellation of symptoms of fear, anxiety, acute mental suffering, aggressive violence, etc., is a better criterion of anticipated improvement from the operation than the diagnostic label.

(Authors' abstr.)

The Question of Vertebral Fractures in Convulsive Therapy and in Epilepsy.

(1) The considerable percentage of vertebral fractures in the mid-dorsal region during metrazol convulsions can be reduced to a great extent by appropriate chemical or, better, simple mechanical means.

(2) Re-examination of eight patients who had severe multiple fractures two years ago showed no orthopedic or neurological signs of progressive pathology.

(3) In electric shock therapy, even without precautions, these fractures are considerably less frequent. By applying an improved technique of extreme hyperextension, they can be avoided, as was shown in 60 cases.

(4) Seizures in epilepsy do not produce vertebral fractures in the mid-dorsal region as demonstrated by a series of 42 epileptic patients. Fractures in other regions of the spine occur occasionally, but they are of a different type and not comparable to the fractures in convulsive treatment.

(5) Vertebral fractures in tetanus have the same localization, about the same frequency and multiplicity as those sustained in metrazol convulsive therapy done without precautions.

(6) The varying frequency of vertebral fractures in the various convulsive conditions is explained by differences in the onset of the convulsion.

(7) No contraindication against shock treatment can be seen in these fractures, which can be largely avoided and which, if they do occur, have no clinical importance. (Authors' abstr.)

The Significance of Vertebral Fractures as a Complication of Metrazol Therapy.

(1) Comparing films of the spine taken before and after treatment in a series of 200 metrazol-treated cases, a fracture incidence of 23 per cent. was found.

(2) Fractures were found more frequently in males (28.6 per cent.) than in females (19 per cent.).

(3) The incidence of fractures is much greater in patients over 55 years of age and under 21. In the former group we believe this is due to the relative osteoporosis present in the spine, while the fact that the spines in the young age group have not attained their full adult strength is a contributing factor to the increase in injury in this class.

(4) The mental condition present and its duration show no relationship to the incidence of fracture in these patients.

(5) Metrazol does not appear to affect the calcium metabolism in the body.

(6) In the 46 cases, 111 vertebral bodies were fractured, i.e. 2.4 per patient. No other parts of the vertebrae were involved, and no dislocations occurred. This would explain the absence of spinal cord involvement.

(7) All the fractures occurred in the dorsal spine, the fourth, fifth and sixth being the most frequently injured.

(8) Multiple fractures occurred more often in males than in females, due in our opinion to the greater muscular development of the former and the more powerful convulsions produced in them.

(9) In agreement with other published reports, we have found that the symptoms produced are much milder than would be expected from examination of the radiographs of the injured spines.

(10) We strongly recommend that routine pre-treatment lateral radiographic examinations of the thoracic spine should be done to determine the presence of any contraindications, and to discover any irregularities in the appearance of the vertebrae which might simulate minor injuries and thus confuse the issue when post-treatment films are examined. All cases should be X-rayed after treatment to diagnose symptomatic and asymptomatic fractures.

(11) Kyphosis, scoliosis, arthritis, nuclear change and old fractures are no contra-indication to metrazol therapy. Osteoporosis appears to be a contra-indication.

(Authors' abstr.)

Electroshock Treatment in the Psychoses.

(1) Electroshock is better than metrazol because the convulsion tends to be less severe and the fracture rate is 5 per cent. (against a fracture rate of 22 per cent. with metrazol).

(2) Electroshock is also preferable because the patient has no recollection of, and consequently is not terrified by the treatment.

(3) It is more easily given to a non-co-operative patient in whom a venipuncture would be difficult.

(4) Electroshock is simple in application and inexpensive for the patient.

(5) The ill-effects of treatment in reference to cardiac stress and strain have been found less severe than similar effects with metrazol and insulin therapy, perhaps because of the lack of side effects from drugs.

(6) This series of cases shows favourable results in involuntional melancholia and in manic-depressive psychoses. The number of cases of other types is not large enough to warrant prediction. However, the treatment does not look promising for schizophrenia.

(7) In spite of the favourable clinical results of electroshock, the authors cannot recommend a routine or indiscriminate use of this treatment. Neuropathological findings in brains of cats subjected to similar dosage are showing scattered punctate hemorrhages. Whether these changes occur in the human subject is not known. Because of this it should be stated that this treatment must be reserved (a) for involuntional melancholias who have been ill more than a few months and who, by our usual standards, do not seem to be doing well clinically; and (b) for manic-depressive cases of long duration with no improvement or those who previously have had prolonged attacks.

For this reason the use of electroshock in the early stage of an illness, or for those who are ill for the first time, or for those being treated on an out-patient basis, must be seriously questioned.

The physician must recognize that the price his patient may have to pay for electroshock

treatment is punctate haemorrhage in the brain. In advising treatment he must balance this possibility against the seriousness of the clinical condition.

From the clinical viewpoint the effect of this treatment on a hospital service is very interesting. The length of hospital residence has been materially reduced for nearly all patients under treatment. The agitated and noisy patients are no longer common on the acute wards and the wards are consistently quieter. The morale of the personnel has been improved by the feeling of active service and treatment for such a large percentage of patients. The recovery of the severe, long-standing, agitated depressions makes a profound impression.

There is no reason to believe yet that this attack on some of the psychoses, particularly the manic-depressive conditions, will affect the cycles seen characteristically or reduce the possibility of further attacks. All we should believe is that by electroshock we can change, reduce, or stop an attack. This means, however, that the length of stay in hospitals may be reduced, a hopeful attitude and greater expectancy of results is produced in some cases, and an economic advantage is gained for both patient and hospital. The clinical services handling patients needing prolonged care should be the ones most benefited, for the disturbed wards are more quiet, and the turnover of patients is more rapid.

The challenge of shock therapy raises many points of importance in both therapy and research. In therapy we must study the effect of subconvulsive doses. In research we must analyse these effects by electroencephalography, estimate the significance of the brain tissue changes, and carry out other experimental studies. The accessibility of the patient during the earlier phases of the illness, the use of psychotherapy in conjunction with the treatment are interesting phases to be investigated.

Our most important problem at the moment is twofold, namely, to find a technique which will reduce the possibility of damage to the central nervous system, and to watch by careful follow-up the neurological and psychiatric course followed by patients who have been benefited.
(Authors' abstr.)

The Menstrual Cycle with Vaginal Smear Studies in Schizophrenia, Depression and Elation.

Observations were made on 817 menstrual bleedings of 221 patients suffering from schizophrenic and affective disorders. A more detailed study has been made in 31 cases by an analysis of the vaginal smears. A greater irregularity in menstrual interval than in a comparable normal group was found. A tendency to a delay, a weakened expression, or a temporary suppression of the follicular reaction was noted. Prolongation of the menstrual interval or amenorrhoea was frequent. Short cycles also were observed. All these abnormalities are interpreted as the result of an adverse effect upon the growth of the ovarian follicles. A correlation between the severity of the illness and the degree of abnormality of the menstrual cycle was found. An improvement in the mental condition was usually accompanied by a change to a more normal menstrual function. The existence of any aetiological relationship could not be ascertained.
(Authors' abstr.)

Convulsions of Early Life and their Relation to the Chronic Convulsive Disorders and Mental Defect.

1. Convulsions repeated over a period of weeks or months during early life are more likely to be followed by epilepsy than a single convulsion or a series of convulsions.

2. A larger number of children have convulsions during the first year than at any other time. Husler judges that in 41 per cent. of his cases the onset of epilepsy was at the age of four. This was not substantiated by the author's recent study where convulsions beginning in the first year were more frequently followed by serious results. Schrenk finds that the peak in "genuine epilepsy" occurs around the second and the seventh-eighth year of life, while the peak in "symptomatic epilepsy" is definitely in the first year of life.

3. The so-called "idiopathic" convulsions are more likely to merge directly into a chronic convulsive disorder than those of any other group except when there is manifest evidence of brain damage.

4. *Petit mal* attacks occurring during the first two years of life are likely to merge into a chronic convulsive disorder or become associated with mental retardation.

5. Convulsions *per se* may cause cerebral damage which affects normal brain development, resulting in mental deficiency.

6. The incidence of infantile convulsions in varied samplings of children studied by different investigators appears to range from 7 to 10 per cent. The author found that 7 per cent. of an unselected group of children had infantile convulsions. A fairly large percentage of all those suffering from epilepsy in adult life give a history of having had one or more convulsions prior to the fifth year of life. Of a series of 300 epileptics studied at a state hospital for epileptics, 50 per cent. gave a history of infantile convulsions.

It has been shown by the author over a period of years that less than 1 per cent. of 8,000 unselected children developed epilepsy, but that 48 (12 per cent.) of a total of 395 children having a history of infantile convulsions developed a chronic convulsive disorder. This would indicate that the child having a history of infantile convulsions is twelve times more vulnerable to epilepsy than a child without a history of infantile convulsions. Still found that 28 per cent. of the infantile attacks merged directly into epilepsy. Patrick and Levy found that 4 per cent. of

their non-epileptics had infantile convulsions, as compared with 20 per cent. of their epileptics. According to these results infantile convulsions increase the chances of epilepsy five times. Whatever the ratio may be, it seems quite evident that infantile convulsions do tend to increase materially the risk of epilepsy and mental deficiency in later life. (Author's abstr.)

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The Hypothalamus in Psychiatry.

(1) Animal experimental work on the hypothalamus has indicated that this structure integrates and may possibly reinforce the effector neural impulses controlling some of the sympathetic and motor manifestations of emotion; however, there is little or no basis for the belief that the hypothalamus governs or even mediates the affective experiences themselves.

(2) On the other hand, work in the author's laboratory has furnished evidence that such a direct psycho-somatic localization probably does not exist, inasmuch as (a) the reactions induced by stimulation of the hypothalamus do not significantly modify spontaneous behaviour; (b) animals with extensive hypothalamic lesions can apparently react in an integrated affective manner; (c) animals subjected to prolonged conditioning procedures or to the induction of an experimental neurosis do not learn to respond to hypothalamic stimulation in ways analogous to their spontaneous or experimental adaptations to emotionally significant situations.

(3) The clinical and pathological evidence as to the role of the human hypothalamus in emotional experience is not conclusive.

(4) It would therefore seem safest in the present state of our knowledge to assign to the hypothalamus its experimentally demonstrable role in reinforcing and co-ordinating the neural and hormonal mechanisms of emotional expression, and reserve for adequate proof the hypothesis that it is either the dynamic source or the seat of experience of affective states. On the other hand, much experimental, psychological and clinical evidence clearly indicates that an emotion is a highly complex psychobiological phenomenon in which not only the central nervous system, but the entire body functions as a whole in its multiple adjustments to its milieu.

(Author's abstr.)

"Sham Rage" in Man.

Two cases of "sham rage" in human beings are presented, one following insulin hypoglycemia, the other following carbon monoxide poisoning. In both cases the involvement of higher centers is stressed, and the resultant "sham rage" is believed to be the result of uninhibited hypothalamic discharge.

The expression of emotion does not necessarily mean that the individual is experiencing that emotion.

There seems to be no reason for accepting the idea that the hypothalamus is the "emotional center" of the body. Affects and emotions are highly complicated psychosomatic processes, which require among other things a functioning cerebral cortex. (Authors' abstr.)

Schilder's Disease in Ergotamine Intoxication.

The case is reported of an adult male patient who, in the course of prolonged use of excessive doses of ergotamine given by the intravenous route, developed a severe condition characterized by profound mental confusion and tonic and clonic spasms, and terminating rapidly in death. Post mortem there was the characteristic picture of acute Schilder's disease. The possible relation of the ergotamine intoxication to the demyelinating process is taken into consideration and briefly discussed. (Authors' abstr.)

Experimental "Shock Therapies" in Cats with Insulin and Metrazol.

No clear quantitative or qualitative changes could be found to differentiate the insulin and metrazol from the control animals when these drugs were given in ordinary therapeutic doses. In the two animals which received relatively massive terminal doses of insulin, cell damage was a little more widespread. (Authors' abstr.)

Use of Amphetamine (Benzedrine) Sulfate in the Treatment of Chronic Alcoholism.

The use of benzedrine sulfate in the treatment of a series of 24 general hospital patients all suffering from severe chronic alcoholism and alcoholic addiction yielded poor results. Some of the possible reasons for these results have been discussed. (Authors' abstr.)

The "Petit Mal" Response in Electric Shock Therapy.

The authors do not deny that an attempt at *petit mal* treatment as a less vigorous form of electric shock might have occasional indications, e.g. in old patients, cardiac hypersensitives and other conditions where we definitely wish to avoid the impact of a generalized seizure. It is also useful if we wish to keep at a minimum the number of convulsions in a given course of therapy. Here a series of *petit mals* seems to prepare the ground and enables us to obtain a result with only one or two convulsions which in the ordinary electric shock treatment is usually obtained only after several convulsions. It might be worth while to try *petit mal* treatment in the future with a different and more intensive procedure. For the present the therapeutic results with *petit mals* are so far inferior to those obtained with the usual electric convulsive treatment that its use should be discouraged if one wishes to obtain full benefits from electric shock therapy. (Authors' abstr.)

Mental Defect in Epilepsy and the Influence of Heredity.

Reports concerning approximately 1,900 extramural patients have been analysed with respect to the present state of these patients and the determining influence of heredity on their mentality. Among these patients 64 per cent. were mentally normal and only 14 per cent. definitely deteriorated, in spite of the fact that the average patient had experienced 2,000 seizures during a period of eight years. The relatives of epileptic patients are more affected by mental disorders of various sorts than the normal population. Patients with essential epilepsy have more relatives with both epilepsy and neuropsychiatric disorders than patients with symptomatic epilepsy. The difference is more pronounced for fathers than for other members of the patient's family.

Patients who were mentally abnormal at birth had approximately twice as many relatives with epilepsy and with psychoses as patients who were normal at birth. Patients whose mentality was normal at birth but is now abnormal have only a few more epileptic relatives than patients whose mentality has been persistently normal. Whatever the mentality of the patient at birth, the earlier in life seizures appeared the greater was the number of relatives with epilepsy.

These data indicate that heredity plays a role in the impaired mentality of certain patients subject to seizures. This role is relatively small if patients were mentally normal before the seizures began. (Author's abstr.)

Clinical and Electroencephalographic Studies in Pyknolepsy.

Eight cases of typical pyknolepsy are presented, of which four ceased spontaneously during the period of observation. Clinically they were similar to *petit mal* epilepsy except for the mildness of their symptoms, the fairly monotonous course, their lack of deterioration and the tendency to spontaneous cure.

Electroencephalographic studies were made on three of these cases after they had ceased, four during their still active phase and one before and after cessation of the attacks. Normal brain potentials were found in the spontaneously recovered cases, whereas in the active ones typical *petit mal* electrical patterns were observed.

It appears that pyknolepsy is a form of *petit mal* because of--

(1) The similarity in the clinical picture.

- (2) The electroencephalographic pattern in the active phase showing a wave and spike formation found in *petit mal* epilepsy.
 (3) The lack of evidence of definite psychogenic factors.
 (4) The high incidence of epilepsy in families of patients with pyknolepsy as revealed by a study of the literature. (Authors' abstr.)

Alcohol Absorption and Intoxication.

Sympathomimetic substances delay absorption of alcohol from the alimentary tract and postpone intoxication.

Parasympathomimetic substances tend to enhance the absorption of alcohol from the alimentary tract.

The use of these drugs, especially benzedrine, cannot be unreservedly recommended in the treatment of acute alcoholism, especially while the patient continues to drink. The use of benzedrine by car drivers for the purpose of preventing drunkenness is dangerous, since the intoxicating effect of the alcohol is not dispelled but delayed.

The above does not apply to the great value of benzedrine in the treatment of chronic alcoholism. (Author's abstr.)

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Variations in Electroencephalogram Associated with Electric Shock Therapy of Patients with Mental Disorders.

1. A group of 61 patients receiving electric shock therapy at the New York State Psychiatric Institute and Hospital were studied electroencephalographically. Over 350 records were obtained on this group of patients. Records were taken immediately after individual shocks, resulting either in "petit mal" or "minor" seizure response or in the generalized seizure response. In addition, the records were obtained at various stages during the course of treatment and at various intervals after cessation of the course of therapy up to a period of six months.

2. Patients subjected to the "petit mal" or "minor" seizure type of treatment by the electric shock method exhibited only very temporary and transient changes in their electroencephalograms taken immediately after administration of the shocking currents. Large series of the "petit mal" type of treatments alone did not produce appreciable alterations in the electroencephalographic patterns, which persisted for a period exceeding 24 hours. In none of these instances was the "spike and dome" pattern, as described in cases of epilepsy, evident.

3. Patients subjected to the generalized convulsive seizure or to a series of generalized convulsions exhibited fairly marked changes in their electroencephalographic patterns, resembling in type those observed after convulsions produced by other means or occurring spontaneously. The larger the series of treatments administered the more pronounced became the abnormalities, and the greater the duration of time for which these abnormalities persisted.

4. In general, the electroencephalographic abnormalities associated with electric shock treatments are for the most part "reversible" in the sense that they gradually disappear. It should be stressed that this does not necessarily imply that any concomitant functional or histopathologic disturbances which may occur as a result of the treatments are also correspondingly "reversible."

5. Continued follow-up studies are being carried out on patients in whom were induced large series of convulsions and whose records after six months still exhibited abnormally slow potentials. (Authors' abstr.)

Changes in the Brain after Electrically Induced Convulsions in Cats.

Electrically induced convulsions were produced in 30 cats.

Subarachnoid hemorrhage, usually of mild degree but sometimes extensive, was found in 14 cats.

Hemorrhage in the brain substance (cerebral cortex and white matter, cerebellum, region of the third ventricle and third ventricle) was found in 9 cats, usually of a punctate type but more extensive in two instances.

Whether similar changes are to be expected in human beings treated with electric shock cannot be determined from this material. (Authors' abstr.)

Experimental Pharmacology of Post-encephalitic Parkinson's Disease.

A large number of drugs which are usually classified as sympathomimetic, parasympathomimetic or central stimulants were administered to several patients with Parkinson's syndrome. Two of these patients were intensively studied over a period of several months.

1. The drug which most consistently and favorably influences tremor and rigidity is scopolamine, especially when given parenterally. Although both atropine and scopolamine have similar peripheral autonomic effects, the influence of the latter drug on the symptoms of Parkinson's syndrome is much greater because of its relatively stronger sedative action.

2. The drug of next importance in controlling rigidity, but having little or no effect on tremor, is amphetamine sulfate. On the other hand, epinephrine markedly increases both tremor and rigidity, probably by a stimulating action on the cortex, thus contributing to the imbalance present in Parkinson's syndrome. That the effect of epinephrine is central rather than peripheral was demonstrated by its intra-arterial administration, so that its action is confined to the muscles. Its adverse effects on tremor and rigidity are prevented by scopolamine. Other so-called sympathomimetic drugs, such as pargadrine, propadrine, ephedrine, p-methoxyamphetamine hydrochloride and 3 4-methylenedioxyamphetamine hydrochloride, had slight or no effect on the symptoms of Parkinson's syndrome.

3. Of the drugs usually classified as parasympathomimetic, only acetylcholine and doryl

had any favourable influence, and these in small measure. That the effect of acetylcholine is central was shown by the fact that when it was given intra-arterially in such doses as to be limited to peripheral activity, it had no effect on either tremor or rigidity. Acetylbetamethylcholine hydrochloride had little or no effect, and the same was true of furfuryltrimethylammonium iodide. On the other hand, prostigmine methylsulfate increased the rigidity, and its related drug, physostigmine, had no effect.

4. The central stimulating drugs, other than amphetamine sulfate, such as caffeine, coramine, metrazole, theophylline with ethylenediamine and strychnine, had slight or no effect on either rigidity or tremor.

The following general hypothesis is offered to explain the action of certain of the centrally acting drugs. Although the pathologic process of Parkinson's syndrome resides mainly in the basal ganglia, the rigidity and tremor are finally the expression of a functional dysbalance between these structures and the cortex, the latter becoming relatively over-active. Scopolamine may be assumed to produce its favourable results by depressing the cortex, while amphetamine sulfate decreases rigidity by stimulating the basal ganglia.

The clinical administration of both these drugs is probably at present the best pharmacologic method of treating the symptoms of Parkinson's syndrome. Amphetamine sulfate, in our experience, is best given dissolved in gelatin, its effect thus being prolonged.

Administration of these drugs by mouth fails to produce comparable beneficial results in the treatment of Parkinson's syndrome. (Authors' abstr.)

The Human Pyramidal Tract. V. Post-natal Changes in the Axons of the Pyramids.

The fibers of the pyramidal tract undergo the following post-natal changes: Early in life all the axons are apparently present and are small, delicate, uniform in caliber, crowded and possibly of a different chemical nature than when mature. During this period they may be non-functional and vulnerable to small lesions. At eight months of age, when voluntary movements are attempted, certain fibers commence to expand at a more rapid rate than others. Individual growth continues, until at two years of age the pyramidal tract simulates in miniature that of an adult. At 22 years of age the pathway possesses a few large, more medium and many minute axons. In senility, on the basis of observations on one specimen, there is a decrease in number and diameter of fibers. It seems reasonable, also, to conclude from the study that integration of the pyramidal tract occurs through morphologic and chemical changes in both the axons and the myelin sheaths rather than in the latter alone, and that different physiologic motor states may be explainable, in part at least, on a neuro-anatomic basis. (Author's abstr.)

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Studies on the Corpus Callosum. I. Laterality in Behavior and Bilateral Motor Organization in Man Before and After Section of the Corpus Callosum.

(1) *Disturbances in motility after section of the corpus callosum.*—In three cases the operation resulted in a unilateral disturbance of motility. Patients 1 and 9, both of whom were predominantly right-sided, were marked pre-operatively by cerebral atrophy and organic defects. Subsequent to the operation patient (1) suffered right-sided paresis after numerous seizures. Patient

(9) displayed transient left paresis, and later, in conjunction with Jacksonian attacks, transient right hemiplegia and aphasia developed. Patient (12) suffered retrograde thrombosis of one of the cerebral veins in the frontal lobe, and hemiparesis resulted. These motor disturbances disappeared completely in patient (9) and were greatly reduced subsequently in patients (1) and (12). Since in patients (1) and (9) the motor signs developed in relation to seizures and not in relation to the side of the craniotomy or their measured laterality, we are convinced that these disturbances had nothing to do with the sidedness or "cerebral dominance" of these patients. We have already noted the changes in laterality in patient (1) which occurred in connection with the paresis of his preferred side. The shift in sidedness in this circumstance far exceeded that found in any typical case of section of the corpus callosum. The reversal of laterality in this condition affected mainly footedness, body orientation and unimanual habits. Bimanual responses were not greatly changed, and eyedness was not modified at all.

In patients (2), (5) and (15) motor disturbances which existed pre-operatively (absence of deep reflexes, hemiplegic residua) were temporarily exaggerated after section of the corpus callosum. The explanation may be, as Pike and his associates have shown, that an operative lesion imposed on an already present lesion (in this case pathologic) may give rise, at least temporarily, to a greater effect than the latter lesion alone. If this is true, the corpus callosum acts as an adjunct to the motor systems of the forebrain in determining skilled movement. It is possible that this explanation also applies to the post-operative onset of temporary motor disturbances in patients (1) and (9).

(2) *Nature of changes in sidedness after section of the corpus callosum.*—It is to be emphasized at the outset that to the casual observer section of the corpus callosum has little effect on the laterality and motor organization of the patient. The changes that do occur are made evident only by extensive sampling and statistical treatment of observations in over 100 different performances. Furthermore, the measured shifts in laterality thus observed are temporary.

The pertinent facts as they appear in the data seem to be as follows: Temporary instability in laterality of function appears in some patients after section of the corpus callosum. Right-sided persons may not be affected at all, even though the section is complete. As judged from the results on three subjects, patients having any marked degree of left-sidedness (i.e. left-sided and ambidextrous persons) are affected more seriously than right-sided patients. After section of the corpus callosum mean decrease and mean increase in laterality are about equal in right-sided persons, but mean decrease is more than double mean increase in patients with notable degrees of left-sidedness. After some two or three months the laterality status of the patients is readjusted, so that the pre-operative laterality is approximated. The fact should be mentioned that of two patients showing dissociation and antagonisms of movement after operation, one (patient 4) was left handed.

Different aspects of motor organization are unequally affected by the operation. Eyedness and writing habits generally are not modified at all. Performances involving bimanual eye-hand co-ordination, unimanual tool using and manipulation and general body orientation are changed most by the operation. When the results in all the cases for all different types of performance are averaged, decreases in laterality exceed increases. This decrease is accounted for entirely in terms of the greater tendency toward ambidexterity after operation among persons possessing pre-operatively mixed dominance or left-sidedness.

Results obtained on patient 18 are presented to show that eyedness may be shifted after resection of one occipital lobe while the patient retains post-operatively the marked dominance of the hands and feet that he possessed before operation.

Results obtained on patient 17 are cited to prove that strong right-sidedness may be present in a person with apparent agenesis of the corpus callosum. Sidedness in this patient was not changed by craniotomy and excision of a mass of cortical tissue lying between the two frontal lobes in a defect of the falx.

(3) *The basis of temporary shifts in laterality after section of the corpus callosum and recovery from the changes.*—The fact that section of the corpus callosum produces equal increase and decrease in laterality in right-sided patients and greater decrease than increase in left-sided patients argues against the belief that the section should abolish all of the learned activities of the "subordinate hemisphere," which must therefore be relearned. It is clear that neither in right-sided nor in left-sided patients who possessed no pre-operative motor deficiencies were the learned activities of the subordinate side abolished. One case in point is that of patient 15, who was right-sided as a young child, but shifted in sidedness because of injury to the motor centers of the left hemisphere. At 10 years of age there remained only minor hemiplegic residua of the right side. After section of the corpus callosum this patient did not lose motor ability on the left side, although according to prevalent ideas the learned activities of the right hemisphere would be almost completely abolished since it was originally the subordinate hemisphere.

It is possible that the best explanation of the present results lies in the postulation that "inherited" sidedness is determined by paired motor mechanisms at different levels of the central nervous system, both cortical and subcortical, but that sidedness which is established through training, as in persons with mixed and left laterality, is in part controlled by paired cortical centers, integrated through the corpus callosum. In cases of such a condition section of the commissural fibers demands a period of readjustment of the cortical nuclei before the partly modified reciprocal balances and functions of the whole system are as stabilized as they were previously. Thus the observed changes in sidedness after section of the corpus callosum are

best accounted for in terms of individual variation in the significance of the cortical commissural system (and hence the cortex as a whole) in motor co-ordination according to the inherited laterality status of the patient.

(4) *The significance of the present results in relation to the concept of lateral cerebral dominance.*—At the outset we must distinguish the general concept of the lateral cerebral control of motor function from the hypothesis that cerebral dominance (dictatorship of one hemisphere over the other) is responsible for laterality of function. The latter belief is clearly disproved by the present results, not only on general but on any number of specific grounds. The former concept based as it is on facts that one hemisphere of the brain plays a predominant role in language functions, complex motor co-ordinations and higher perceptual processes is evaluated by the present experiments in the following respects: To the extent that the concept correctly states certain facts of neurology, the present data would seem to purge the view of any implication that the predominance of one hemisphere in mediating a given function, e.g. speech, is dependent on extensive intercortical inhibition and facilitation or on education of the subordinate hemisphere by commissural paths from the dominant side. Perhaps it is feasible to reorganize the concept of lateral cerebral dominance to concur with a generally recognized fact of modern neurophysiology, namely, that different levels of the nervous system co-operate in integrating postural reactions and transient motor response in such a way that although different levels may predominate in control of limited aspects of an organized activity, discrete division of labour between levels is lacking in the intact organism. Consideration of this point of view leads us to believe that lateral neural dominance may involve dominance of brain stem centers as well as cortical centers. In this connection Pike, Elsberg, McCulloch and Chappell showed that section of the commissural system of the midbrain in cats has far greater effect on motor capacity than cutting the fibers of the corpus callosum.

(5) *The nature of sidedness in behavior as indicated by the present results.*—Many statements have appeared in the literature concerning the question whether or not behavior laterality is a unit trait. Those asserting the unitary character of sidedness ordinarily imply in their beliefs adherence to the hypothesis of lateral cerebral dominance as a basis for the imbalance between the two halves of the body.

The present study tends to deny the view that sidedness is unitary in character, as well as the view that the central balances related to different aspects of sidedness are neurologically a unitary system. The complex character of sidedness has been brought out especially clearly in relation to eye dominance and other aspects of sidedness. The profile method of measuring sidedness devised in this study shows, in addition, that many different types of motor performance display varying degrees of sidedness and are not uniformly affected by lesions of the nervous system.

In general, the results of this study and additional considerations lead us to believe that any uniformity in sidedness in the subject is probably derived from strong original imbalances in the neural mechanisms of the postural system early in life, and the integration through learning of correlated lateral habits with this primary neural sidedness. (Authors' abstr.)

The Amnesic Syndrome.

The amnesic syndrome, in three grades of severity, but limited to patients in whom the memory deficit was the predominant feature and not a part of a more sweeping disorganization, is described. Attention is called to the variation in the behavioral pattern, with increasing impairment in utilization of material which had been previously experienced. In the first patient the inability to connect the moment to what came before and the paucity of material for inner stimulation led to loss of initiative, apathy, passivity and disturbance of the grasp of time relations. The forerunners of confabulation and retrogressive defects could be noted. In the second patient the disturbance in use of transient and sequential material was more obvious and gave rise to distortions of recollection; events prior to the damage to the brain could be recalled with outside aid but remained isolated and without proper temporal allocation, and this was the major source of the confabulation. The third patient, unable to recollect after a few moments, was totally disorientated and unable to regain anything from recent years; all utterances were based on faulty orientation and were confabulatory.

The major manifestations of the syndrome—passivity, confabulation, disorientation, loss of "time sense" and difficulties in altering the orientative set (Einstellungsstörung) appear as consequences of the disruption of integrated behavior when the past is not freely available. The hypothesis is offered that both retrogressive deficits and inability to deal with transient events can be understood as parts of the difficulty in freely evoking past experiences. Utilization of post-traumatic events is most seriously disturbed because they are not met by the background of past experience essential to full perception. (Author's abstr.)

Factors Affecting Changes Produced in Electroencephalogram by Standardized Hyperventilation.

Electroencephalograms were recorded on normal male subjects during and after three-minute periods of standardized hyperventilation. Breathing was timed by metronome at 15 breaths per minute and the depth adjusted by instructing the subject according to the excursion of the drum of a Roth-Benedict metabolism apparatus to 20 c.c. per pound (44 c.c. per kilogram) of body weight.

Blood from a finger pad, taken just before and just after hyperventilation, was analysed for total carbon dioxide, pH (serum) and sugar. In spite of variations in the post-ventilation values caused by peripheral vasoconstriction, it is inferred that the standardization of breathing produces a considerable and fairly constant respiratory alkalosis (pH increased by 0.20 unit; carbon dioxide tension reduced by 18 mm. of mercury).

As a measure of the modification of the electroencephalogram, we counted the number of waves above an arbitrary size, never reached in normal control records, that passed an electrical filter broadly tuned to 5 cycles. We also measured a modified "delta index." Repeated tests on a given subject at intervals of 15 minutes to 3½ hours produced fairly constant increases in the five-cycle count and the maximum delta index.

Metabolic alkalosis (pH up to 7.64 before hyperventilation) and acidosis (pH down to 7.29) produced by oral ingestion of sodium bicarbonate and ammonium chloride respectively caused no significant change in the effect of hyperventilation on the electroencephalogram.

Hyperventilation with oxygen produced less alteration in the electroencephalogram than when air maintained at 20 per cent. oxygen content was breathed.

Low blood sugar (80 mgm. per hundred cubic centimetres or less) favoured the appearance of delta waves, and a high sugar level (over approximately 120 mgm. per hundred cubic centimetres) strongly tended to prevent their appearance. At a given blood-sugar level there were considerable individual differences in the amount of five-cycle and delta activity, and the subjects varied somewhat in their responses from day to day, but the effect of low blood sugar is so important that the level must be controlled if hyperventilation is to be standardized as a test for stability of the electroencephalogram.

The subjects reported less tingling sensation and stiffness of facial muscles and showed less peripheral vasoconstriction when breathing oxygen or when the blood-sugar level was high than under the opposite circumstances.

When large clear trains of delta waves appeared the subjects often reported lapses of attention or loss of precise memory for events during the test. Their spirograms showed that full standard depth of respiration was not maintained at such times.

In interpretation it is suggested that hyperventilation causes the appearance of five-cycle and delta waves by inducing cerebral vasoconstriction, which in turn causes diminution in the supply of oxygen and dextrose to the cerebral cortex. (Authors' abstr.)

Vascular and Interstitial Cell Changes in Thiamine-Deficient Animals.

Pigeons were made acutely, chronically and very severely deficient in thiamine by feeding by tube a purified diet free of thiamine according to methods outlined before. Kittens were similarly treated. The brains were stained by methods which demonstrate the neurofibrils and chromatin material in the neurons, the perivascular connective tissues and the interstitial tissues.

The vascular lesions were studied in detail. They were preceded by vasodilatation and consisted of perivascular extravasation first of fluid and later of red blood cells. Infiltration of the surrounding tissues followed. The distribution of these lesions corresponded to the distribution of degenerating neurons, as outlined before. They first appeared in the vestibular nuclei and then spread to other parts of the brain, notably the nucleus rotundus of the thalamus. Later they appeared in the oculomotor nucleus and the paraventricular region of the third ventricle. Although neuronal lesions were always found surrounding hemorrhages, hemorrhages were frequently absent from regions containing degenerating neurons.

It is suggested that an accumulation in the neighbouring tissues of metabolites from interrupted carbohydrate metabolism in the neurons as a result of thiamine deficiency caused the blood vessels to dilate and become abnormally permeable. As a consequence, first fluid and then red blood cells collected in the perivascular spaces.

Proliferation of the adventitial tissues of the small blood vessels and gliosis accompanied the hemorrhages and are thought to be non-specific reactions to degeneration of neurons (as is seen usually in degenerative processes in the brain).

Swelling of oligodendrocytes and clasmotodendrosis of astrocytes were observed in the brains of kittens with very acute thiamine deficiency in which many necrotic neurons were observed. Presumably these changes were due primarily to a sudden lack of thiamine. On the other hand, the oligodendrocytes remained relatively unchanged and the astrocytes became markedly hyperplastic and hypertrophied in kittens with chronic deficiency. These changes were considered to be non-specific and related to the gliosis which occurs when neurons die. Perhaps the products of degeneration furnish the stimulus which causes these changes.

Our observations do not support the thesis that thiamine has specific anti-degenerative properties. (Authors' abstr.)

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Electroencephalographic Studies on Neurosyphilis.

E.E.G. records were obtained from 175 patients with neurosyphilis, in 124 of whom the condition was diagnosed as G.P.I., in 20 as tabes dorsalis, in 11 as juvenile G.P.I., in 8 as optic nerve atrophy and in 12 as meningovascular syphilis. These tracings were compared with the records from 215 normal controls.

Normal E.E.G. tracings were found in 19 per cent. of the patients (treated and untreated) and in 70 per cent. of the controls. Borderline records were found in 28 per cent. of the patients and 23 per cent. of the controls. Abnormal records were found for 53 per cent. of the patients and for 7 per cent. of the controls.

Abnormal E.E.G. tracings were as common among patients with pure tabes and those with optic atrophy as among patients with G.P.I.

The records of 73 untreated patients with G.P.I. showed a higher percentage of borderline and abnormal patterns than the records of 63 patients who had received treatment for nine months or more.

No characteristic E.E.G. pattern was found to be associated with neurosyphilis or with any type of neurosyphilis. The E.E.G. has therefore no significant diagnostic value.

The 73 untreated patients with G.P.I. presented a degree of abnormality in the E.E.G. which corresponded roughly with the clinical severity of the disease.

Follow-up E.E.G. records on many of the patients undergoing treatment with clinical improvement are presented. In most instances there was concurrent improvement in the E.E.G. tracings.

E.E.Gs. with abnormally slow, high-voltage cycles were more likely to be found among patients with G.P.I. who showed confusion, disorientation and profound memory loss, while rapid cycles were more common among those with euphoria or other mood disturbances and paranoid ideas without the aforementioned signs. Slow cycles indicated more serious cerebral dysfunction than did rapid cycles.

The majority of abnormal patterns associated with all types of neurosyphilis were similar from homologous areas of the two hemispheres. This observation, together with the fact that abnormal records were as frequent in cases of pure tabes and optic nerve atrophy, suggests that lesions in or near the upper portion of the mid-brain and the diencephalon may have more to do with the abnormal cortical electrical potentials than the cortical lesions.

(Authors' abstr.)

The Brain in Sickle Cell Anemia.

The essential neuropathologic features of sickle cell anemia are small, necrotic and necrobiotic lesions on a vascular basis, diffusely distributed, with predilection for the border between the cortex and the subcortical white matter; a marked general hyperemia and congestion of blood vessels; hypertrophy and proliferation of endothelial and adventitial elements of the walls of small blood vessels; siderotic pigment in intra-adventitial spaces and adventitial cells; large vascular lesions of uncharacteristic type (softenings, thromboses, etc.), small hemorrhages and extravasations; intravascular lipoid material and fat embolism of capillaries and pre-capillaries; focal and diffuse changes in the nerve cells in cortical and subcortical gray structures, and focal areas of demyelination in the spinal cord, similar to those seen in subacute combined degeneration. (Author's abstr.)

Leukocytosis During Various Emotional States.

Leukocytosis is of frequent occurrence in patients with emotional disorders. Most of these patients show no infectious process or structural changes to account for the elevated white blood-cell count. Briefly the observations on 200 psychiatric patients were as follows: There was no definite correlation between the level of the white cell count and the specific psychiatric disease entity. On the other hand, in certain patients with an elevated white cell count the degree of leukocytosis was often related to the intensity of the psychopathologic emotion. This relation was consistent in the same subject but varied from patient to patient. The emotional reactions associated with leukocytosis were fear and panic reactions, depression with anxiety (agitation), subacute and persistent anxiety states, persistent intense resentment and excitements, which were characterized by overactivity with fear and anxiety or with elation and anger. Leukocytosis was not observed in any cases of sadness without anxiety or elation without anger.

Leukocytosis cannot be explained solely by the emotional factor. In one case in which there was marked anxiety a low white cell count was persistently found. Improvement in the emotional reaction, either spontaneous or induced by sedation, was associated with the return of the leukocyte count to normal levels. The intravenous administration of sodium amylal induced striking reductions in elevated leukocyte counts when there were accompanying favourable changes in the emotional status. The specific gravity of the blood plasma often varied in patients with leukocytosis, and it usually was reduced by intravenous injection of sodium amylal; however, changes in the white cell count and the plasma specific gravity occurred independently of each other. Alterations in the sedimentation rate were frequently independent of changes in the white cell count. Similarly, a lack of correlation between the blood-sugar levels and the white cell count was often observed, although high blood-sugar values were frequently found in patients with marked panic and with excitement accompanied by great anxiety. (Authors' abstr.)

Intracranial Blood Flow in Dementia Paralytica, Cerebral Atrophy and Schizophrenia.

The average total intracranial blood flow was 131 c.c. per min. for 18 controls, 129 for 12 mildly demented and 97 for 15 severely demented patients with G.P.I.

The average intracranial blood flow was 101 for 8 persons with nonsyphilitic cortical atrophy. In this group there appeared to be a relation between the blood flow and the degree of cortical atrophy.

The average intracranial blood flow for 16 schizophrenics did not differ significantly from that of the control group; however the values from person to person showed much greater scattering. There was a suggestive tendency for patients who exhibited increased psychomotor activity to have higher values than patients who exhibited decreased psychomotor activity. (Authors' abstr.)

Factor of Hypoxia in the Shock Therapies of Schizophrenia.

In schizophrenics receiving various forms of shock therapy, it was found that the oxygen saturation of the arterial blood diminished with the metrazol treatment when the convulsions were modified by administration of erythroidine or curare. Electrical shock therapy also revealed depression of the oxygen supply of the brain. A comparison was made between these physiologic results and those obtained with the therapeutic agents: (a) Metrazol alone, (b) potassium cyanide and (c) insulin. With all these hypoxia occurred, with consequent depression of brain metabolism. The relation of this depression to the ameliorative effect on the course of the disease is discussed. (Author's abstr.)

Electroencephalograms of Thiamine Deficient Pigeons.

Pigeon brain potentials have been recorded during various stages of vitamin B₁ deficiency, and compared with records taken during control periods before and after institution of the specific deficiency diet. Thiamine deficiency caused a progressive increase in amplitude of brain potentials to as much as three times the normal value. This change was apparent in the E.E.G. before clinical signs developed.

During opisthotonos the brain potentials not only were of large amplitude, but showed a complex change in frequency with lower frequencies becoming more prominent. The change in frequency was not uniform but seemed to indicate selective action on certain groups of

neurons. This was corroborated by histologic study. In some pigeons paroxysmal epileptiform waves appeared during a certain stage of the deficiency syndrome.

During enopisthotonos the rapid frequencies largely disappeared, leaving relatively slow waves to characterize the entire record.

The brain potentials changed toward normal a few hours after administration of thiamine, but if extreme deficiency had developed the E.E.G. did not return completely to normal until after 10-17 days of normal diet.

It is suggested that the changes in brain potentials indicate marked facilitation of cortical discharge during the initial phases of thiamine deficiency before its final depression. This type of effect is compared to that of oxygen and dextrose deficiency, in which similar changes in brain potentials occur. (Authors' abstr.)

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A Study of Some Personality Characteristics of Epileptics.

By means of three standard intelligence tests, a self-ordinary-ideal rating scale, the Rorschach test, two variations of the level of aspiration technique and certain clinical data the modes of behavior and attitudes of non-deteriorated idiopathic epileptics were compared with those of matched groups of (1) siblings of epileptics, (2) cardiac patients, and (3) normals (siblings of the cardiac cases). It was found that the personality characteristics appearing in the non-deteriorated epileptics (e.g. a tendency to withdraw into themselves; to impose a form of self-limitation; to feel superior in respect to their attitudes, interests, and feelings, but inferior in respect to behavior, etc.) were best explained as resulting from their reactions to the paroxysmal disorder. There was no evidence to support the conception that either epileptics or their siblings possess a personality constellation which predisposes them to the paroxysmal disorder.

K. W. SPENCE (Psychol. Abstr.)

BRAIN.

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Structure of the Neurohypophysis with Special Reference to Nerve-Endings.

(1) The pars nervosa of the neurohypophysis of the horse has been the main object of study, particularly the nerve endings found in the organ. A number of facts have been established.

(2) The rather poorly developed fibrous capsule of the organ, the blood-vessels with their adventitial connective tissue and the multitudes of nerve fibres may be regarded as the essential structural elements which, in combination, form the framework of the pars nervosa.

(3) The blood-vessels are everywhere surrounded by the perivascular space, a zone which varies in width, is comparatively free of cells, and is never encroached upon by the neighbouring nerve bundles, although these are often densely packed together in the intervening areas.

(4) The neuroglia is arranged in much the same characteristic manner as neuroglia elsewhere. The cell bodies lie closely applied to the surfaces which nerve bundles present to the perivascular space, and their slender protoplasmic processes stretch directly across the space to end in the adventitia of the associated blood vessel.

(5) At various points along their course, numerous isolated nerve fibres leave the bundles to end in one or other of three main sites, viz. (a) around the blood-vessels of the pars nervosa, where they crowd the perivascular spaces; (b) in the pars intermedia, where a large number end

in relation to the blood-vessels; and (c) in the meningeal terminal corpuscles, which are sensory structures very rich in nerve-endings. The corpuscles project into the fibrous meningeal tissue which lies at the apex of the pars nervosa near the point where the inferior hypophyseal arteries enter.

(6) All these terminal nerve fibrils of the pars nervosa are very much alike in type. Along their course and at their ends they show swellings, bulbs, clubs and meniscus-shaped masses. They are, in fact, similar in arrangement and appearance to the perivascular sensory endings found in other parts of the animal body.

(7) The very large number of nerve endings of sensory pattern found in the neurohypophysis forming, as for the most part they apparently do, a perivascular receptive apparatus leads to the conclusion that the nerves of the pars nervosa are mainly centripetal conductors and that therefore the pars nervosa is primarily a sensory organ.

(8) Neither the apparently casual nature of the anatomical relationship subsisting between neuroglia cells and nerve-endings nor the size and morphological characters of the nerve-endings themselves are features compatible with the hypothesis that the hypophyseal neuroglial cells of the horse constitute a specific gland of internal secretion innervated by any substantial part of the hypothalamic-hypophyseal system.

(9) In view of the analogies with terminal sensory apparatus found in organs whose acknowledged function is to detect variations in the composition and pressure of the blood, it is suggested that the ensemble of terminal sensory endings we have described in the neurohypophysis may constitute a "chemo-receptive" or "presso-receptive" apparatus devoted to the reception of stimuli which enable the hypothalamic centres to control the metabolic and hormonal functions of the body. (Author's abstr.)

The Anatomy and Physiology of Cutaneous Sensibility.

From the many and diverse studies considered, certain conclusions seem to be emerging. The doctrine of specific nerve energy receives support from clinical, physiological and anatomical sources, but it is not the individual impulse that shows specific qualities, but rather the entire sensory pathway, for each mode of sensibility, along which pass the streams of nerve impulses. It is specific in a physiological as well as in an anatomical sense; specific in the morphology, selective excitability and other qualities of the end-organs; in the grouping together from peripheral origin to central destination of the fibres that carry the impulses for each sensory modality; in the fibre types involved and this in turn involves some specificity in the impulse potentials and in the conduction rates and excitability of the fibres; in the central excitatory states that modify each category of sensory impulse; and finally in the central destination of the impulses.

The long-established view that there are four primary modes of cutaneous sensibility—touch, pain, cold and warmth—also receives consistent support. Head's view that local sign in sensation and two-point discrimination are qualities inherent in the tactile impulse and are imposed by it on other modes of sensibility finds no support, and is incompatible with the results obtained in every field of research on sensory function.

Further, yet another conception is becoming clearer, namely, that of the physiological unit of sensory reception. Sherrington has shown that the physiological motor unit is the motor nerve cell and all the muscle fibres it supplies, some 150 or more. Reflex movement gradation is achieved by the fractionation of muscles into these groups. It seems that the unit of sensory function is similarly constituted consisting of a posterior root fibre and all the end-organs (of a given mode of sensibility) that it innervates. Such a unit may reach macroscopic proportions, being disposed in the skin in area and in depth. Activation of a single "spot" within this unit influences every other spot within it. The unit's complexity is reflected in the fact that each group of end-organs (touch, pain, cold or warmth spots) receives its principal innervation from no less than two nerve fibres, and that each individual end-organ receives also an "accessory" innervation which appears to endow it with pain sensibility when supramaximally stimulated. Before this conception can be regarded as fully elucidated and confirmed much has yet to be learned, but it is one in harmony with what we know of the management of movement by the central nervous system. The view that end-organs have a selective excitability is reasonably established, and the accessory nerve supply of end-organs clears up some of the difficulty that this conclusion has previously presented.

Much of the obscurity surrounding the anatomy and physiology of the mechanism subserving pain has been removed by the work of Woollard and his pupils, work which constitutes one of the most striking advances in our knowledge of sensory function within recent years. When its biological implications are fully taken into account, and irrelevant standards of assessment abandoned, pain sensibility appears not to differ essentially from other modes of sensibility.

Problems of localization and discrimination of sensory stimuli promise to receive a large measure of solution in the light of what we are learning of the nature of the physiological sensory unit, in which connection Tower's observations are of great significance.

On the negative side, it is clear that Head's theory of the morphological constitution of the afferent nervous system is invalid, and that Jackson's doctrine of release of function has proved singularly disappointing as a generalization of the observed facts of sensory loss from lesions of the nervous system. Possibly it simply awaits a more penetrating application to these facts than it has yet received. Head's general theory is fatally handicapped by the attempted inclusion in it of a fallacious notion of the structure of the peripheral mechanisms of cutaneous

sensibility. It attributes to simple conductors functions they cannot possibly subserve and succumbs to the danger that always besets abstract thinking—that of confusing thoughts with things, of hypostatizing abstractions. Those familiar with Faber's *Nosography in Modern Internal Medicine* will recall how the progress of medical thought was held up in the early years of the last century by the prevalence of abstract thinking and the false analogies it engendered. Further, Head's theory embodies views on the evolution of structure and function in the nervous system that find neither internal nor external corroboration, and are indeed incompatible with all we know of this evolution. Nevertheless, when all that is speculative and abstract is removed from Head's contributions to this subject, there remains a most impressive body of observation that must have permanent value and will serve as the material for a more realist interpretation.

Running as a recurrent theme through many of the writings on cutaneous sensibility we find a tendency, uniformly unfortunate in its results, to postulate anatomical structures without taking the steps necessary to establish whether or not they exist. Head's protopathic and epicritic fibres, Lewis's nocifensor nerves, and the hypothetical dual system of pain fibres for the conducting of the different sensory qualities of pain, all come to grief when they make contact with the hard facts of anatomy. Perhaps it is not the least of Woollard's services to science to have redressed the balance between anatomy and physiology in the study of sensory function.

With the increasing range and complexity of experimental methods, workers in the different fields inevitably show signs of isolation from each other's thought, and of a lack of sound orientation in the general field of sensory function. The mass of literature that the past few years has provided has tended, also, to a neglect of the fundamentally important work on sensation of the closing years of the last century. The maximal exploitation of original observation in any single department of the general field can be attained only by those who are familiar with the results of research, old as well as new, in other departments. It is in connection with Trotter's contributions that this reflection seems most pertinent. To anyone who is actively thinking on the problems of cutaneous sensibility they are full of stimulating thought and of sane realism. Thus, his surmise as to the basis of sensory hypoaesthesia and his findings on the selective excitability of nerve fibres foreshadow the work of Woollard and the observations of the electro-physiologists. It seems likely, also, that his views on the insulation of the nervous system and on the peculiar structure of the pain nerve-endings may throw light on the abnormal patterns of innervation and the abnormal subjective sensory symptoms (e.g. causalgia) that may ensue upon peripheral nerve lesions.

We have become too prone to regard the nervous system as a kind of ideal structure immune from the pathological reactions to damage that all other somatic tissues show, and thus as giving us a licence to speculative and abstract thinking about it that we would be wary of in respect of any other tissue.

(Author's abstr.)

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The Radical Treatment of the Psychoses and Neuroses.

The prefrontal regions, man's most distinctive cerebral endowment, are probably concerned with foresight, imagination and consciousness of self. Their analytic, synthetic and selective capacity as purely intellectual processes has probably been overstressed. The strong two-way connection with the nucleus medialis dorsalis of the thalamus makes for definite affective toning of ideas, particularly those in relation to the self. The prefrontal region may be spoken of as projecting the total personality into the future, the energy drive and the emotional component reinforcing the intellectual operations in the quest of the ideal. Prefrontal lobotomy, by cutting off the affective component from the ideas that are concerned with the self, radically alters the personality of the individual in that it makes him no longer interested (affectively observant) in himself, either as an integrated collection of organs, or as a limb of society. His mental processes are to that extent simplified, and he can go about the business of living with less than the normal burden of guilt, remorse, indecision, sensitiveness, self-consciousness and fear.

Out of the authors' 80 cases operated on in five years, the most recent observed for at least a year, 20 are regularly employed, 7 are studying or partially employed, 22 are housekeeping, 18 are at home, 6 are in an institution and 7 are dead. Of his 38 cases of involuntal depression, 24 have given a good result and 10 a fair one; of 18 obsessive tension states, 14 have given a good result and 4 a fair one; of 12 schizophrenics, 6 have given a good result and 4 a fair one; of 8 psychoneurotics, 6 have given a good result. The most prominent mental symptoms produced by the operation were lack of initiative, euphoria, procrastination, laziness, tactlessness, and sarcasm. A large proportion showed an increased appetite. Psychometric tests showed an improvement in cube construction test (speed) in 58 per cent., in arithmetic test (speed) in 68 per cent., in cancellation test (accuracy) in 60 per cent., in color-naming test (speed) in 60 per cent., in coin-under-cups test in 73 per cent. G. W. T. H. FLEMING.

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The Uneven Development of Various Frequencies Represented in the Electroencephalogram and the Berger Rhythm.

There are large individual differences in the uneven predominance of high and low frequencies. The Berger rhythm is based on the predominance of one or two frequencies. The alpha waves express the predominance of one periodic process, the beta waves represent a complex of all the others. At times peripheral stimuli reinforce one frequency, so that the Berger rhythm does not disappear through peripheral stimulation but is reinforced. In lower animals, light stimulation and increased excitability of the cortex through drugs cause changes similar to those leading to the Berger rhythm. Thus the Berger rhythm may be regarded as a process which has been prepared through phylogenetic evolution. H. L. ANSBACHER (Psychol. Abstr.).

Rhythmical Stimuli and the Interrelationship of the Cortical Regions.

Flicker produces in the visual cortex a predominance of periodic processes the rhythm of which is most like that of the stimulation. After sudden cessation of the flicker sometimes cortical fluctuations of the same or of a multiple rhythm are found. Rhythmic acoustical stimuli cause cyclic potentials in the auditory region, rhythmic tactile stimuli in the motor region. The rhythmic activity of the visual cortex produced by flicker spreads to the auditory region, and, to a lesser degree, to the motor region. Flicker facilitates the periodic processes caused by tactile stimulation. After two stimuli of different sense modalities and of the same frequency have been applied, one of them alone, which previously by itself was inadequate, produces the cyclic response. H. L. ANSBACHER (Psychol. Abstr.).

The Human Electroencephalogram.

The E.E.Gs. of 11 normal subjects showed regular alpha waves of a frequency of 10-12 per second and irregular, more frequent beta waves. The E.E.G. is characteristic for the individual, but intraindividual fluctuations exist. Alpha waves are obtained from the occipital, precentral and frontal regions; waves of high frequency (200-450 per second) from precentral regions. Peripheral stimuli depress the alpha waves. Waves obtained from occipital regions are depressed particularly by optical stimuli, those from precentral regions by motor stimuli. Mental activity also causes depression.

H. L. ANSBACHER (Psychol. Abstr.).

Adaptation of the Human Cortex to Continuous Stimulation and After-depression of the Rhythms.

With continuous light stimulation of the eyes the E.E.G. shows at first a depression of the alpha and an increase of the beta waves, then adaptation, as manifested by reappearance of the alpha waves. After the light source is turned off, again a depression with subsequent adaptation is found. The same is found in continuous auditory stimulation and its cessation. The crucial factor for depression of the alpha rhythm is change in the stimulus situation, cessation of the stimulus as well as its onset.

H. L. ANSBACHER (Psychol. Abstr.).

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Error, Symbol and Method in the Rorschach Test.

Using the term "error" in its root sense of a "wandering about," Rorschach test procedures are liable to errors on several grounds. (a) Need of definitions: Neither the personality as a whole nor the component factors are being validated by stable frames of reference. Operational criteria are suggested. (b) Inadequate clinical experience by Rorschach investigators: This experience is essential for the understanding of the psychology of the several personality groups studied by the test; hence it is a *sine qua non* for understanding the psychological meaning of Rorschach test findings. (c) Failure to control by the usual scientific techniques the method for identifying the separate Rorschach factors (denoted by the symbols of the Rorschach language), out of which the entire personality structure is patterned. (d) Halo, which results from the examiner's direct contact with the subject whom he is examining.

The variability of separate Rorschach factors (or personality traits), depending on the entire personality pattern, is discussed and illustrated. It is indicated that Rorschach findings for any one individual can be restated in the neurological concepts of Jackson, the psychological concepts of Freud, or the topological concepts of Lewin. These three systems of thought, therefore, offer validating approaches for the personality as a whole as revealed by the Rorschach test. The Rorschach investigator must, however, subject his separate factors to the necessary controls so that he will be able to solidify the scientific foundations of the test.

(Author's abstr.)

A Projective Approach to Personality Patterns during Insulin Shock and Metrazol-Convulsive Therapy.

The present findings indicate that there is a considerable shift in the several Rorschach signs from one examination to another, both in the psychiatric cases and in the control subjects. It appears that this shift is more striking in the psychotic subjects, although there is some overlapping of the two groups. It would seem, however, that the response differences which make their appearance in the psychotic series are changes which take place within the individual psychotic framework, rather than changes in the direction of what are customarily considered normal patterns. This trend is less true for those patients who show the most complete clinical recoveries, although even here there remain certain rigid elements of the psychotic pattern which apparently are little affected by the therapy despite the fact that a clinical improvement has been evidenced. *In the light of this fact, one might question whether the pharmacological shock therapy has brought about any deep restructuring of the personality pattern or of its underlying dynamisms.* An extension of the present study to a point where the data can be treated statistically would seem to be of utmost importance. It is obvious that changes take place in both groups, and that these changes bear definite relationships to the particular groups. The nature and significance of these shifts are matters for further research. (Author's abstr.)

Differentiating Psychometric Patterns in Schizophrenia and Manic-depressive Psychosis.

1. The Wechsler-Bellevue Adult Intelligence Scales were administered to 76 schizophrenic and 25 manic-depressive patients and to 92 normal student nurses.
2. The highest ranking test in the psychoses is that of information which apparently remains well preserved; the lowest ranking test is digit symbols, requiring new associations and learning.

3. The results show that the schizophrenics as a group have higher verbal than performance I.Qs., while the opposite is true of the manics. The differences between the groups are statistically significant.

4. The application of an index obtained by the ratio of the three high-ranking sub-tests to three low-ranking tests, in a selected group of schizophrenics (considered in greater detail in a previous study), differentiates significantly between the schizophrenics, on the one hand, and manics and normals on the other.

5. It may also be concluded that both the discrepancy between the I.Qs. and the "schizophrenic index," especially the latter, may be utilized in dubious cases where the diagnosis wavers between manic-depressive psychosis and schizophrenia. (Author's abstr.)

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Human Intelligence after Removal of Cerebral Tissue from the Right Frontal Lobe.

Two cases are presented in which surgical excision of scar tissue from the right frontal pole had been made; evidence is given showing the minimal extent of the lesions. The post-operative Stanford-Binet (Form L) I.Q. in one case was 139, and her Arthur performance and McGill revision of the Army Beta scores were 53.90 and 94 respectively. The second case had a pre-operative I.Q. of 92 (Stanford-Binet), and his post-operative rating was 94. These data are regarded as further evidence opposed to the localization of Binet or performance-test ability in the frontal association areas." C. N. COFER (Psychol. Abstr.).

Side Lights on Cerebral Evolution: Brain Size of Lower Vertebrates and Degree of Cortical Folding. By mathematical treatment of certain data the author shows that "the higher we go in the phylogenetic scale. . . the more rapidly brain size increases with bodily size." It is also

indicated by this treatment that man's brain is not relatively larger than that of some monkeys; man's superiority to monkeys "lies in the fact that the degree of folding and with it the mass of the cortex is a function of the absolute size of the brain." Methods are described for the analysis of the amount of folding of the cortex, and some data are presented. It is seen "that the folding of man's cortex follows the same phylogenetic laws as that of mammals in general." Man's mental superiority is due to the progressive differentiation of his brain.

C. N. COFER (Psychol. Abstr.).

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The Challenge of Social Neurosis.

Social neuroses must be distinguished from organic disease and other forms of neuroses. In the differential diagnosis, social psychology and sociology may be helpful. The treatment comprises social therapy and medical psychotherapy. The author is of the opinion that the right to treatment of social neuroses must be acknowledged even in cases where no compensation liability is involved. He also points out that in many insurance policies, nervous and functional sequelae of accidents are excluded. In his opinion there is no legal or medical reason for "such exceptional and undemocratic laws."

S. M. COLEMAN.

Pneumographic Patterns.

Analysis of the pneumographic pattern demonstrated that the respiratory movements occurred in all but the tonic phase of the convulsion. That these movements indicated a proportionate passage of air in and out of the thorax was demonstrated by the placement of nasopharyngeal catheters, and taking simultaneous records of the passage of air with the movements of the respiratory musculature. These findings tend to dispute the theory of anoxia due to respiratory arrest during the convulsion. Metrazol convulsions were followed by hyperpnea, and the incidence of respiratory plateaux and sighing were both diminished; the effects noted were maximal shortly after the seizure.

S. M. COLEMAN.

Narcoleptic-Cataleptic Syndrome.

The various constituents of the syndrome are described in terms of an excessive and dissociated reaction of the sleep mechanism. Two cases are recorded in which sleep hallucinosis occurred; in one there has been elaboration of the dream content without any psychotic manifestations, in the other a paranoid hallucinatory psychotic state finally supervened on the basis of the abnormal dream content. The resemblance of these organically conditioned states to those of hysteria is pointed out.

S. M. COLEMAN.

Epilepsy and Suicide.

A total of 67 deaths from suicide out of about 75,000 epileptics is presented. This proportion suggests that suicide among epileptics is rather more common than is generally suspected. The author regards the convulsion in essential epilepsy as a symbolic suicide and therefore evidence of the suicidal motive, which may sooner or later be accomplished in fact.

S. M. COLEMAN.

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Abstract Art as an Expression of Human Problems.

An analysis of the abstract art productions of psychopathic patients showed that abstract forms are in very close connection with important specific psychological contents. This is true for colours as well as for forms. In obsessional neurotics the abstract principles in drawing have a deep connection with the basic motor drives of the individual, especially problems of aggression and of being attacked. In schizophrenics the form problem may be incidental to the deeper lying schizophrenic meaning expressed in comparatively simple lines. However, a deep regression to the essentials of form principles can occur in schizophrenics.

S. M. COLEMAN.

Exhibitionism.

A report on a series of five cases of exhibitionism all of whom are stated to have benefited by psychotherapy. The author finds that as a group compulsive neurotic exhibitionists are shy, retiring, over conscientious and usually well-educated. The elements of the Oedipus complex seem to play an important part in the majority of cases. As a rule they have been unable to make a satisfactory heterosexual adjustment and have continued masturbation throughout adult life. Economically many have not made the progress that their education and intellect warranted.

S. M. COLEMAN.

Pharmacological Aspects of Shock Therapy.

The literature on the pharmacological aspects of the various forms of shock therapy is reviewed. It is concluded that insulin and metrazol act in a similar way, and that in both instances it would seem that any improvement of the mental disease is associated with depression of cerebral metabolism.

S. M. COLEMAN.

The Obsessive-Compulsive Neurosis in Children.

The general literature on the obsessive-compulsive neurosis in children is reviewed and the importance of impulses as differentiated from obsessions and compulsions is emphasized. Six cases of the neurosis in children are described. The view is taken that a more serious attitude towards this neurosis in children should be taken.

S. M. COLEMAN.

Zinc-Insulin in Mental Disorder.

Ten patients (9 schizophrenics, 1 behaviour disorder) were treated with a solution of zinc-insulin crystals injected intravenously over a period of from 6 to 21 weeks. Three patients were improved, seven unimproved.

S. M. COLEMAN.

FEBRUARY, 1942.

- *Psychoneurosis in a Hospital for Mental Disease. *Farr, C. B., and Stewart, G. M.* . . . 133
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Psychoneurosis in a Mental Hospital.

Two hundred unselected psychoneurotic cases have been analysed and the follow-up findings after one to sixteen years recorded in 174. In 26 there is no record subsequent to the discharge of the patient. It is concluded: That it is not possible to anticipate type or intensity of attack from a study of the preneurotic personality; that, while typical neurotic personalities were common in the series, nevertheless, clearcut attacks did develop in seemingly competent, well-integrated individuals, though the latter had shorter attacks; that, while more women become psychoneurotic, the rate of recovery of previously well-adjusted individuals is twice as great as that of men, but relapses are more frequent: 13 per cent. subsequently became psychotic, while a further 18 per cent. presented psychotic symptoms; the incidence of psychosis in those diagnosed hysteria was 17 per cent.; in compulsion neurosis 19 per cent.; in neurasthenia 12 per cent.; in reactive depression 0 per cent.; in anxiety state 8 per cent. 8 per cent. committed suicide early or late and none were in the group that later became psychotic. In a further 18 per cent. suicide attempts or ideas were noted. S. M. COLEMAN.

Coramine in "Reversible" Psychoses.

Twenty-one patients suffering from various forms of psychogenic psychoses were treated with a series of 12 to 15 injections of 10 to 25 c.c. of coramine solution. There resulted 4 remissions—19 per cent.

The typical coramine reaction is described, the high convulsive threshold discussed. It is suggested that coramine is of value in the treatment of mental illness because of its ability to produce "shock" without the induction of a convulsion. Sclerosis of veins towards the end of treatment was the only complication. S. M. COLEMAN.

Vitamin B and E in Tabes Dorsalis.

Eighteen patients with advanced tabes received vitamin B and E therapy for periods ranging from three months to two years. 17 of the 18 patients received intraspinal injections of thiamine chloride in doses ranging from 10–50 mgm., from one to six treatments per patient. All of them also received vitamin B complex or wheat germ oil concentrated orally.

Most improvement was noted in gait, muscle strength and tone, co-ordination, bladder functions, in reduction of frequency of gastric crises and lightning pains. The treatment can be used concurrently with fever therapy and arsenical medication. It appears to enhance the therapeutic results of fever therapy and increases the tolerance to arsenic and heavy metals. No severe reactions and no deaths are reported. S. M. COLEMAN.

Sensory Disturbances Following Insulin.

Disturbances of cutaneous sensation, and sensation of taste and smell, were observed in the course of, and following insulin shock treatment in 10 patients out of a group of 103. Possible explanations are discussed. S. M. COLEMAN.

MARCH, 1942.

- *Hypoglycaemic Shock Therapy Produced by Insulin Administered Intravenously. *Mahoney, V. P., and Herskovitz, H. H.* . . . 265
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 The Aggressive Female "Psychopathic" Personality. *Conn, H. J.* . . . 316
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Hypoglycaemic Shock Therapy Produced by Insulin Administered Intravenously.

This method of producing hypoglycaemic coma was carried out in one psychoneurotic and seven schizophrenic subjects. The method is not superior to the Sakel technique and its use is not recommended. S. M. COLEMAN.

Cerebral Dominance in Speech.

Four cases concerning transfer of cerebral dominance in the function of speech are reviewed. In these the common factors were (1) loss of function in the right hand, (2) adoption of function by the left hand, and (3) years later, the onset of aphasia; the variable factor was that in two of the cases the aphasia was provoked by a lesion in the right hemisphere and in two by a lesion in the left. It is suggested that the function of speech is not relinquished by one hemisphere and taken up by the other, as the shift from the use of the one hand to the other occurs, but continues rather to be participated in by both hemispheres. In other words, it implies that in each of the four cases, if the lesion had occurred in the language zone of the opposite hemisphere to which it actually did, aphasia would also have resulted.

S. M. COLEMAN.

Abstinence in Delirium Tremens.

It is concluded from clinical evidence, based on over 100 cases, and the experience of most workers in America, that, providing the general needs of the patient are cared for, abstinence is not a factor in the onset of delirium tremens. Pathologically, there is no evidence for it, and the evidence of hepatic disfunction is a strong contraindication to the giving of liquor.

S. M. COLEMAN.

Electro-encephalography in Head Injury.

It is concluded that the E.E.G. is a valuable aid in the study of the sequelae of head injuries. No abnormal waves were found in four cases in which the diagnosis was hysteria. The E.E.Gs. of 8 of 11 cases in which the diagnosis was post-concussion syndrome showed abnormal waves. The most consistent findings (5 cases) in the post-concussion syndrome were occasional short bursts of 6-8 per second rhythm occurring diffusely in all leads. These slower rhythms were frequently of greater amplitude than the normal alpha waves.

In all 5 cases with traumatic epilepsy abnormal E.E.G. records were obtained. These showed poor alpha activity and occasional bursts of slow high amplitude potentials. In two cases there was electrical evidence of definite epileptogenic foci.

S. M. COLEMAN.

Schizophrenia with Severe Diabetes.

A case of schizophrenia with severe diabetes is presented. The differential diagnosis of a diabetic psychosis is discussed and dismissed because of the absence of crucial symptoms for the latter, and the lack of response to the anti-diabetic treatment as far as the psychotic symptoms were concerned.

S. M. COLEMAN.

Dreams of Schizophrenic Patients.

An investigation of about 200 dreams of 12 schizophrenic patients of various subtypes and stages of the psychosis is made in order to study the peculiarities of schizophrenic dream life as a part of the psychopathology of schizophrenia and the applicability of dream analysis in schizophrenia for clinical purposes.

It is concluded that no dreams are specific for schizophrenia. Schizophrenics are found to attach more meaning to their dreams than does the normal; they often interpret spontaneously. Certain bizarre-cosmic dreams are almost exclusively correlated with severe dissociation and disturbance of thought and speech.

There does not seem to be a very promising field for diagnostic or therapeutic applicability of dream analysis in schizophrenia.

S. M. COLEMAN.

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Grand Mal Seizures in Tetany.

A three-year-old coloured male with rickets and a low average blood serum calcium suddenly developed severe right-sided Jacksonian convulsions. These seizures were due to an associated tetany as demonstrated by the Erb test. The convulsions have been controlled for 49 months with anti-rachitic therapy, although the last Erb test was still positive for tetany.

S. M. COLEMAN.

Metrazol Therapy in the Affective Psychosis.

Partial and full remissions together in the treated cases were 92 per cent. and in the controls 72 per cent. (full remission 82 per cent. and 38 per cent. respectively). Subsequent to examination the average duration of illness was 1½ months with treatment and 6 months without.

There were 5 deaths in the untreated cases (3 from suicide and 2 from exhaustion) and one suicide in the treated cases. The writer is of the opinion that sub-convulsive doses of metrazol predispose to therapeutic failure. Clinical fractures were 6 per cent., subclinical fractures of the spine 31 per cent., transient memory impairment 56 per cent. and transient cardiac arrhythmia 3 per cent.

S. M. COLEMAN.

Cortical Frequency Spectra of Healthy Adults.

The electrical activity of the frontal, parietal, occipital and temporal cortex of both hemispheres has been studied in 20 healthy adults by analysing electroencephalograms from these areas with the Grass method of spectrum analysis.

S. M. COLEMAN.

Attempted Suicide.

One hundred and fifty cases of attempted suicide admitted to a general hospital are reviewed. It was found that a large majority showed defective personality integration. About 20 per cent. were psychotic, and organic disease was present in about 33 per cent. In 29 no classification could be arrived at. More women attempted suicide but more men actually committed suicide. Successful suicide was more common in older patients. Sex difficulties and lack of occupation was frequently encountered as factors in the aetiological constellation. Only 11 patients had been seen by a psychiatrist at some time previous to the suicidal attempt.

S. M. COLEMAN.

Blood Bromides.

Of 145 consecutive admissions, 16 patients (11 per cent.) had a blood-serum bromide level over 26 mgm. per cent., but only one patient had a blood-serum bromide level higher than 150 mgm. per cent. This patient presented a rather typical clinical picture of a bromide psychosis. The next highest bromide level, 136 mgm. per cent., showed no evidence of a bromide psychosis.

S. M. COLEMAN.

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Effects Evoked in an Axon by the Activity of a Contiguous One.

Several conditions of contact (ephapse) between two isolated *Sepia* axons permit study of the electrical reactions evoked in one (initially active or at rest) by the electric activity of the other.

The current spread from the active axon serves as a polyphasic electrical stimulus to the contiguous axon. The general appearance, height and duration of this stimulus depend, on the one hand, on the shape, height and propagation speed of the action potential of the active fiber; and, on the other, on the geometrical conditions of contact and on the excitability characteristics of the receptive axon.

When the contact conditions are such that the currents penetrating the resting axon have a large final positive phase, they produce no visible effect on it. When this final positive phase is sufficiently depressed, the effects of the preceding negative phase predominate and evoke characteristic subliminal or liminal active electrical reactions of the resting axon. This case is realized for the portion of the resting axon in contact with a termination of the active axon and to a spike ending there. The phenomena in such an experimental arrangement have been observed and analysed in detail. The active axon which conducts an impulse towards the contact region has been called the afferent or pre-ephaptic axon; the axon acted upon by it, the efferent or post-ephaptic axon.

When contact conditions are such that the action currents of the afferent impulse constitute only a subthreshold stimulus to the efferent axon, this responds with a local potential of variable height and either aperiodic or with damped oscillations. When the pre-ephaptic action currents reach a threshold value a spike is discharged along the post-ephaptic axon, 2 to 5 msec. after the afferent spike reaches the contact zone. This interval is occupied by the rise of the local active prepotential to a threshold value. Depending on the state of the effector axon, an after-discharge may or may not follow this first spike.

Additional phenomena appear when the efferent axon displays an initial oscillatory activity of its own. In this case, a subthreshold afferent spike brings about incrementing of the spontaneous oscillations of the efferent axon; and often, after a few such increasing oscillations, the discharge of a spike. As the stimulating value of the afferent impulse increases to threshold, the delay at the ephapse shortens and finally becomes less in the cases considered in the preceding paragraph. If the autonomous activity of the efferent axon includes a periodic discharge of spikes, the introduction of an extra-response, by means of an afferent spike, causes a break in

this rhythm. An early extra-response is followed by a prolonged cycle, as if there were a compensatory pause.

The ephaptic phenomena have been discussed in relation to synaptic phenomena and to other interaction phenomena between central cells, particularly those involved in synchronization. (Author's abstr.)

Localization of Enzymes in Nerves. I. Succinic Dehydrogenase and Vitamin B₁.

Studies have been initiated to determine the distribution in the nerve cell of different enzymes possibly important for nerve activity and to compare it with the distribution of choline esterase. The enzyme activities have been determined in sheath and axoplasm of the giant fiber of squids and in the head ganglion. So far succinic dehydrogenase, the succinic oxidizing system and vitamin B₁ as diphosphothiamine have been determined.

(1) About 90 per cent. of succinic dehydrogenase of the giant axon are located in the axoplasm. The experiments bring no evidence for the assumption that the enzyme is concentrated at or near the surface. The distribution is in striking contrast to that of choline esterase. In the head ganglion the concentration of succinic dehydrogenase is about ten times as high as that in the fiber. The oxidation of succinic acid occurs at the same rate as its dehydrogenation.

(2) Diphosphothiamine is concentrated several times more in the sheath than in the axoplasm. This fact supports the assumption that vitamin B₁ is required for the formation of acetic acid for the acetylcholine from pyruvic acid. The distribution differs from that of choline esterase as well as from that of succinic dehydrogenase. (Author's abstr.)

Cerebellar Action Potentials in Response to Stimulation of the Cerebral Cortex in Monkeys and Cats.

Single shock electrical stimulation of the cerebral cortex results in action potentials in the cerebellum in the cat and monkey. These responses recorded oscillographically are most marked contralaterally, but homolateral responses are also present. The stimulation of a single cortical point with a well localized stimulus may result in action potentials in all the cerebellar lobes which receive pontocerebellar connections.

Action potentials, in response to stimulation of the cerebral cortex in the cat, were observed in culmen, lobulus simplex, lobulus ansiformis, declive and tuber vermis, paraflocculus and pyramis. In the monkey, in addition to these lobules, responses were present in the uvula. Border-line zones between the pontine and spinal subdivisions of the cerebellum in the cat were dominated by cortico-pontocerebellar connections in the monkey. It appeared from the restricted zone of spinocerebellar connections in the monkey, as compared to the cat, that this growth of pontine connections was to some degree at the expense of spinocerebellar connections.

In the cat cerebellar action potentials were elicited most consistently following stimulation of the sigmoid, coronal, anterior ectosylvian and anterior parts of the lateral, suprasylvian and middle ectosylvian gyri. There were isolated responses in occasional experiments when the posterior ectosylvian, posterior suprasylvian and posterior part of the middle ectosylvian gyri were stimulated. No action potentials were seen following stimulation of the sylvian and remaining divisions of the lateral or marginal gyri. No other areas of the cat's brain were explored in these experiments. Among the areas stimulated in the cat, no topographical or cyto-architectonic subdivision appeared to be represented exclusively or even predominantly in any cerebellar lobe.

In the monkey the most widespread cerebellar action potentials were evoked when areas 4 and 6 and the post-central gyrus were stimulated. In addition, the stimulation of areas 8, 9 and 10 in the frontal lobe, areas 7, 18, 19, 21, and 22 in the parietal, occipital and temporal lobes, produced action potentials in the cerebellum, particularly in lateral and posterior lobules such as the lobus ansiformis. Conversely the projection, as judged by the amplitude and threshold of the responses, was relatively greater from the pre- and post-central gyri to the vermian and paravermian lobules.

Differences in the amplitude of the action potentials and in strength of the threshold stimulus necessary to produce them were less marked when the topographical subdivisions of the cerebral cortex were compared. By comparing the percentage of low threshold points in the face, arm and leg subdivisions of the "sensory" cortex, as delineated by Dusser de Barenne and his associates, when leading from some of the cerebellar lobes, certain differences were observed which may indicate a slight preponderance of connections to certain lobes from these topographical subdivisions. Among the vermian and paravermian lobes there was a tendency for the face area to show the greatest percentage of low threshold responses in the more rostral lobes, such as culmen, while the projection from the leg zone was judged heaviest in the caudal lobules, such as lobulus paramedianus and pyramis. The arm area was intermediate between these two extremes. No differences between topographical areas could be detected if only the presence or absence of response was observed and some low threshold points to culmen were noted in the leg zone and vice versa. No significant difference in threshold or amplitude of the responses between Crus I and Crus 2 of lobulus ansiformis could be demonstrated when either cytoarchitectonic or topographical subdivisions were compared. They both showed the largest percentage of low threshold responses from stimulation of the face areas. There was no evidence from this study of afferent connections that the cerebellar control of the lower extremity rested in Crus II of the lobulus ansiformis. (Author's abstr.)

The Effects of Polarization on Nerve Action Potentials.

1. At the anode of a constant current applied to a green frog sciatic or cat saphenous nerve (A fibers), the following changes in the amplitude of the components of the action potential are observed:

(a) The spike increases in height with increasing strength of polarization up to a maximum usually 20-40 per cent. above the polarized height; if the polarization is increased further, the spike height decreases. Successive block of fibers in the nerve with increasing strength of polarization probably accounts in large part for the differences between these observations and those on single fibers.

(b) The negative after-potential increases in size up to several times its unpolarized size, and increases in duration unless it is shortened by (c).

(c) The late positive after-potential increases in size and duration in keeping with the increase in size of the negative after-potential.

2. At the cathode of a constant current applied to A fibers:

(a) The spike decreases (to 40-80 per cent. of normal height with the strength of polarization, giving the maximum spike at the anode); the decrease varies with the strength of polarization.

(b) The negative after-potential is decreased and may completely disappear.

(c) Early positive after-potential may appear to be increased because of (b), but is not; late positive after-potential is decreased.

3. The changes in amplitude of the various components of the action potential of C fibers (bullfrog splanchnic, cat hypogastric, vagus or other autonomic nerve) are in general the same as those just described for A fibers, but the after-potential changes are relatively greater. Under favorable circumstances, increase of early after-positivity with anodal and decrease with cathodal polarization may be observed.

4. These observations may be simply and satisfactorily described by the statements: (i) The negative after-potential, like the spike, is increased in amplitude at the anode and decreased at the cathode; and (ii) the positive after-potentials are affected by polarization, as are the negative potentials which they succeed.

5. These observations are consistent with already known properties of the components of the action potential. (Author's abstr.)

Stimulation of Peripheral Nerve Terminations by Active Muscle.

When a muscle is activated indirectly by a motor nerve (ventral root) volley, centripetal volleys ensue. These may be recorded in the stimulated ventral root and in neighboring ventral and dorsal roots.

The latency of the secondary centripetal discharges is equal to the sum of conduction time from the stimulating electrodes to the muscle, neuromuscular delay, a short utilization period, and conduction time from the muscle to the recording leads. In the case of secondary centripetal discharges into a stimulated ventral root, the consequences of refractoriness add to the total latency.

The secondary centripetal discharges reflect faithfully the intervention of neuromuscular transmission and muscle action as steps in their causal sequence.

The secondary centripetal discharges are initiated by muscular processes approximately equal in duration to and coincident with the ascending phase of the muscle action potential at or near the junctional region. (Author's abstr.)

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- VOL. XIII. 1940.
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Psychiatric Concepts of Recreation.

A short historical introduction is followed by a survey of modern American psychiatric opinion on the value of recreational therapy, the views of Adolf Meyer, William White, W. R. Duntton, R. G. Hoskins, L. E. Hinsie, A. Myerson and Karl Menninger being epitomized. It is concluded that the various concepts relating to the therapeutic employment and usefulness of recreation have shown a gradual evolution from emphasis upon the physical component to group adaptation. From this step of socialization there has been a further advance in the examination of the capacity of this therapeutic approach to affect the mind in the sense of a possible mental readjustment. There is also evidence of a still further evolution in the utilization of the deeper interpretative system of psychoanalysis. The writer points out that the therapist cannot fit in to such a progressive system unless he is better trained in fundamental psychiatric concepts, ideas and methods.

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Apraxia Phenomena in Aphasia Patients.

This paper is based on Grunbaum's attempt to bring aphasia into causal relation with disturbance of the body schema; without suffering from apraxia, aphasia patients are frequently not able to imitate postures. Examinations with modified Head tests of 23 cases of motor and sensory aphasia showed that the disturbance is clearly dependent upon the severity of the aphasia. The disturbance is regarded as constructive apraxia of one's own body; it is free from spacial disturbances in copying designs, construction, etc. It is not due to agnosia of the body parts, but to a reduction in the ability to use the body schema.

H. L. ANSBACHER (Psychol. Abstr.).

PSYCHIAT. NEUROL. WCHNSCHR.

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A Ten-Year Comparative Study of the Treatment of General Paresis with Fever Therapy (Radiant Energy) and Chemotherapy.

(1) In the comparison of the results of the treatment of general paresis by fever therapy (with or without chemotherapy) with the standard chemical therapeutic procedure, the authors find certain similarities in the results: (1) The average periods between treatment and death and the average periods before discharge are similar in the two groups.

(2) The cases committed for more than four years have little chance of discharge.

(3) The mortality from treatment or following treatment is much greater with chemotherapy (48 per cent.) than with fever treatment (11.2 per cent.).

(4) The percentage of markedly improved cases discharged is much greater after fever therapy than after chemotherapy (90 per cent. vs. 53 per cent.).

(5) The percentage of cases unimproved or still under commitment is approximately the same in the two groups. (Authors' abstr.)

Massive Dose Testosterone Therapy in Male Involutional Psychosis.

(1) Metrazol shock therapy still appears to be the treatment of choice in involutional melancholia.

(2) In certain selected cases in which metrazol shock therapy cannot be instituted for one reason or another, it appears that massive dose testosterone therapy is associated either with remission or partial remission.

(3) An attempt has been made to explain the mechanism of such remission.

(4) Neither priapism nor any other harmful effects were observed during the course of this experiment despite the fact that tremendous doses of testosterone propionate were administered. (Author's abstr.)

Asphyxial Episodes and their Prevention in Electric and Other Convulsive Therapies

It is felt that, in convulsive therapy, one should not wait until there is reason for alarm before intervening to end post-convulsive apneas. If respiration has not begun within a few seconds after the fit, it is probably desirable to assist the patient in terminating his anoxia as quickly as possible. The most favorable position for breathing is dorsal hyperextension with the arms drawn up over the head to facilitate the initial movement, inspiration. The simplest effective stimulus is a sharp extension, with the turning of the head on the neck; and this also seems to clear the airway. This procedure retains its effectiveness on repetition. When necessary, full artificial respiration in the dorsal position may be done according to the Silvester method. Further, in difficult cases, one should open the airway with a narrow retractor curved to fit the back of the tongue and inserted between the teeth behind the mouth gag. This should always be done where other procedures are ineffective. Chemical respiratory stimuli do not appear to be of any value here. No observations have been made to indicate that the effectiveness of convulsive therapy is diminished by reduction of anoxia. A case of non-fatal post-convulsive respiratory arrest is reported. The personnel which assists with the electric shock treatments can be trained to act as a team which divides the task of carrying out the arm movements, applying chest compression, and maintaining a free airway. These measures can be improvised, but are far more effective when carried out by a group practised in their routine application. (Authors' abstr.)

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*Frontal Lobotomy in the Treatment of Chronic Psychotic Overactivity. <i>Cohen, L. H., Novick, R. G., and Ettelson, A.</i>	96

Frontal Lobotomy in the Treatment of Chronic Psychotic Overactivity.

In this paper there are presented six patients with chronic psychotic overactivity who were subjected to bilateral frontal lobotomy. All the patients were psychotics (probably all schizophrenics) who had been ill from 8 to 28 years, and who had manifested persistent aggressiveness, combativeness, and destructiveness. The pertinent literature has been cited and shown to be equivocal. In the present series five of the six patients "improved," to some extent at least, with respect to the diminution of their overactivity. On the present empirical basis, granted

the paucity of cases, frontal lobotomy seems to exercise sufficient benefit for the patient to warrant further investigation with respect to its effects on psychotic activity disturbances.

(Authors' abstr.)

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Relation Between Structural and Functional Differentiation of Nerve Centres and Tracts in the Chick Embryo. <i>Visitini, F., and Levi-Montalcini, R.</i>	381
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In Commemoration of Eugen Bleuler.	I
*The Problem of Memory. <i>Roosen, R.</i>	33
Relation Between Structural and Functional Differentiation of Nerve Centres and Tracts in the Chick Embryo. <i>Visitini, F., and Levi-Montalcini, R.</i>	119
Neuropsychiatric Certifications in the Field. <i>Littmann, J.</i>	215

The Problem of Memory.

Roosen's thesis is: There is no basic distinction between living and non-living matter. Colloidal properties are possible to all matter. Not only living matter, but atoms, protons, and electrons have biological mnemonic functions (quicker repetition of a once-experienced reaction, reciprocal attraction, economy of force, creative purposeful co-operation). Engram activity is a reciprocal influence on the vibration of particles, independent of the mass of the bearer, indestructible, extending infinitely into space. The distinction between the sensory world and the world of physics is fundamental. Formation of engrams belongs exclusively to the latter; their ekphoria, to the former. Memory based on protoplasm belongs to both worlds; that the substratum of which is non-living colloid, sometimes appears in the sensory world as rudimentary traces; that which has a non-colloidal base is confined to the world of physics.

These concepts give a new idea of death. When protoplasm disintegrates the collections of engrams constituting personality are annihilated. This is death in the sensory world; but memory traces belonging to the world of physics persist to infinity as social memory.

M. E. MORSE (Psychol. Abstr.).

VOL. XLVI.	1941.
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Z. KINDERPSYCHIAT.

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1. Anatomy, Physiology, Biochemistry, Pathology, etc.

Vitamin A Deficiency and the Nervous System. *Wolbach, S. B., and Bessey, Otto A.* [Arch. Path., **32**, 689-722 (1941).]

In vitamin A-deficient rats the epithelial changes are not related to the nerve lesions. The latter are produced during the period of rapid growth and are caused by specific early retardation of bone growth. The nervous system continues to develop normally, and this causes overcrowding of the cranial cavity and the spinal cord. Later, general retardation of growth occurs.
M. L. C. BERNHEIM (Chem. Abstr.).

Nervous Disorders of A Avitaminosis: True and False "Irreversibility." *Mouriquand, G., Rollet, J., Edel, V., and Pape, A.* [Rev. neurol., **72**, No. 5, 463-5 (1939-40).]

Animals (rats, etc.) suffering from avitaminosis A showed, besides the ocular lesions and general classic disorders (mucous keratinization, infections, etc.), nervous manifestations mainly of the paraplegic type. Young animals developed normally with the exception of only those nervous disorders which were rarely observed in adult animals (even if exhibiting the signs of other disorders accentuated by A avitaminosis). The sensitivity of the nervous system to this avitaminosis decreased (owing to age) during successive deficiencies. The nervous lesions behaving like irreversible lesions were in reality "false irreversibilities." The animals recovered slowly on prolonged action of carotene or vitamin A.
W. R. HENN (Chem. Abstr.).

Wernicke's Encephalopathy: Its Clinical Features and Their Probable Relation to Vitamin B Deficiency. Campbell, A. C. P., and Russell, W. R. [*Quart. J. Med.*, **10**, 41 (1941).]

In some cases there is a relation between the clinical features of Wernicke's encephalopathy and vitamin B deficiency. In others none could be demonstrated.

J. T. MYERS (Chem. Abstr.).

Cholinesterase in Sciatic Nerve of Vitamin B₁-deficient Pigeons. Pighini, G. [*Biochim. terap. sper.*, **27**, 114-17 (1940); cf. *C.A.*, **34**, 3292⁹.]

The cholinesterase activity of suspensions of sciatic nerve was low in avitaminous birds and was minute in cases with leg paralysis.

B. C. P. A. (Chem. Abstr.).

Variations in the Nervous Excitability of the Rat Deficient in Thiamine. Chauchard, P., and Mazoué, H. [*Compt. rend. soc. biol.*, **135**, 138-40 (1941).]

Chronic thiamine deficiency in young rats at first depresses and then excites the nerve centers.

FELIX SAUNDERS (Chem. Abstr.).

The Effects of Thiamine on the Nervous Excitability of Rats Deficient in Thiamine. Chauchard, P., and Mazoué, H. [*Compt. rend. soc. biol.*, **135**, 156-8 (1941).]

Thiamine-deficient rats show a decrease in chronaxie. Within 30 minutes after injection of thiamine the chronaxie has returned to normal.

FELIX SAUNDERS (Chem. Abstr.).

Vitamin B₁ and Cocarboxylase in Central Nervous System. Cedrangolo, F. [*Arch. sci. biol. (Italy)*, **26**, 89-102 (1940).]

Vitamin B₁ (1) and cocarboxylase (1 pyrophosphate) were determined separately in boiled extracts from various parts of the central nervous system of the ox. Free (1) was determined by the thiochrome method, cocarboxylase by a fermentation method. The average values obtained were (in γ per g. fresh tissue), cocarboxylase—cerebral cortex 2.04, cerebellum 1.40, spinal cord 0.84, white matter 0.26; free (1)—0.92, 0.58, 0.40 and 0.24 respectively. As some time elapsed between slaughtering and preparation of the extracts there may have been slight breakdown of the cocarboxylase originally present.

B. C. P. A. (Chem. Abstr.).

Relation Between Vitamin B₁ and Acetylcholine Metabolism. Brücke, Franz Th. v., and Sarkander, Hans. [*Arch. expil. Path. Pharmacol.*, **196**, 213-25 (1940).]

In pigeons fed only polished rice the serum cholinesterase rises to several times its normal value. Vitamin B₁ quickly brings it back to normal. In the rice-fed pigeons the injection of physostigmine will produce opisthotonic convulsions before the birds begin to show signs of vitamin B₁ deficiency.

L. E. GILSON (Chem. Abstr.).

Action of Thiamine on the Nerve Centers of the Normal Animal. Chauchard, Paul. [*Compt. rend. soc. biol.*, **135**, 136-8 (1941).]

Intraperitoneal injection of thiamine into guinea pigs and rabbits produces a rapid fall in the peripheral motor chronaxies. Injection of thiamine into frogs produces convulsions resembling those caused by strychnine. These effects last 30-60 minutes.

FELIX SAUNDERS (Chem. Abstr.).

The Clinical Value of the Thiochrome Test for Aneurin (Vitamin B₁) in Urine. McAlpine, D., and Hills, G. M. [*Quart. J. Med.*, **10**, 31 (1941).]

The method of Hills was used. A 24-hour specimen of urine was collected with a few c.c. of HCl and 1 c.c. of toluene as preservative. The patient was then given a breakfast low in thiamine (white bread, butter, honey and tea) and the bladder emptied in three hours. A similar meal was now given supplemented by 1 mgm. of thiamine orally and the bladder emptied in three hours. The amount of thiamine excreted three hours after 1 mgm. of thiamine is a better test than the ordinary 24-hour specimen. It can be used as a guide to treatment in cases of polyneuritis of unknown origin. A daily oral dose of 3 mgm. suffices for the treatment of polyneuritis. Intravenous injection is unnecessary unless there is vomiting or diarrhoea.

J. T. MYERS (Chem. Abstr.).

The Oral Ascorbic Acid-tolerance Test and Its Application to Senile and Schizophrenic Patients. Stotz, Elmer, Shinnors, Burton M., and Chittick, Rupert A. [*J. Lab. Clin. Med.*, **27**, 518-26 (1942).]

A dose of ascorbic acid (6 mgm. per kgm. of body weight dissolved in one-half glass of water immediately before administration) is fed to the fasting patient, the time in minutes being noted. Oxalated blood samples are obtained before feeding the acid and during a 5-hour period after feeding. As no food is given during the test, the patient is allowed a cup of coffee and plain toast after taking the acid. This does not materially affect the tolerance curve. Under these conditions rarely more than 10 to 15 per cent. of the acid is excreted during the test. The blood samples are chilled immediately and are analysed the same day. In this study the method of Stotz (*C.A.*, **35**, 5145⁴) for the determination of vitamin C was employed. On the basis of 60 determinations and on experimental changes produced in the tolerance curve upon supplementary feeding and deprivation of vitamin C, the curves were classified into four groups of

relative saturation (saturated high normal, low normal and under-saturated). In a clinical study the main characteristics of these curves could be adequately distinguished by determinations on a fasting blood sample and two specimens in the next five hours. Since none of the patients whose curves were in the under-saturated area showed any signs of clinical scurvy, the test can be used to distinguish relative degrees of saturation or to differentiate between sufficiency and mild deficiencies. It overcomes the unreliability of a single fasting determination of plasma ascorbic acid and eliminates the technical difficulties of the urine collection in previous tests for the degree of vitamin C saturation. By this method vitamin C deficiency, which was not related to dietary habits, was observed in senile patients. There was no indication of a disturbance of vitamin C saturation in schizophrenic patients.

HOWARD W. ROBINSON (Chem. Abstr.).

Loss of Nerve Endings in Degenerated Skeletal Muscles of Young Vitamin E-deficient Rats. Telford, Ira R. [*Anat. Record*, **81**, 171-81 (1941).]

Skeletal muscles from vitamin E-deficient rats with only a slight degree of degeneration showed no appreciable loss of nerve endings. The striated muscle with considerable damage revealed a marked reduction in the number of nerve endings. The number of nerve endings returns to normal upon recovery of the muscle fibers from the dystrophic changes.

PHILIP D. ADAMS (Chem. Abstr.).

Tocopherol Level in Serum of Normals and Patients with Amyotrophic Lateral Sclerosis. Wechsler, Israel S., Mayer, Gerda Gernsheim, and Sobotka, Harry. [*Proc. Soc. Exptl. Biol. Med.*, **47**, 152-6 (1941).]

In normal men and women serum tocopherol ranged from 0.59 to 1.62 mgm. per cent., as determined by a photolorimetric method. Untreated patients with amyotrophic lateral sclerosis show values within the normal range. The blood level rises on oral administration whether or not clinical improvement follows. Intramuscular injection without simultaneous oral administration produces a drop in serum tocopherol.

L. E. GILSON (Chem. Abstr.).

Brain Degeneration in Young Chicks Reared on an Iron-treated Vitamin E-deficient Ration. Adamstone, F. B. [*Arch. Path.*, **31**, 603-12 (1941).]

Nutritional encephalomalacia can be produced regularly in chicks, if the vitamin E in the diet is destroyed by treatment with FeCl_3 in ether, and the ether evaporated by heat. If heat is not used, or the food is treated with ether without FeCl_3 and the ether evaporated with heat, the disease does not occur. The addition of corn or peanut oil or wheat germ to the diet is largely effective in preventing the disease, which seems to be caused by vitamin E deficiency, together with some other factor.

M. L. C. B. (Chem. Abstr.).

Convulsive Syndrome in Young Rats Associated with Pyridoxine Deficiency. Daniel, Esther P., Kline, O. L., and Tolle, Chester D. [*J. Nutrition*, **23**, 205-16 (1942).]

The U.S.P. vitamin B-deficient diet contains insufficient pyridoxine to maintain the young normally through the period of lactation. A syndrome occurring in the young was characterized by frantic running about the cage, loud cries and convulsive seizures. The condition was not cured by the administration of liver extract, yeast or thiamine, but was prevented and cured by crystalline pyridoxine.

C. R. FELLERS (Chem. Abstr.).

The Clinical Manifestations of Nicotinic Acid and Riboflavin Deficiency (Pellagra). Sydenstricker, V. P. [*Ann. Internal Med.*, **14**, 1499-1517 (1941).]

An adequate diet is the most important therapeutic measure in all avitaminoses. Regardless of the administration of pure vitamins, sufficient amounts of protein, fat and minerals must be supplied. The administration of large amounts of a specific vitamin for treating symptoms of a single dominating avitaminosis will precipitate subclinical deficiencies of other members of the group.

J. T. MYERS (Chem. Abstr.).

Pellagra and Insanity. Löfvendahl, H. [*Nord. Med.*, **8**, 2269 (1940).]

Nicotinic acid in the urine of 85 patients suffering from insanity was determined according to Porjé's method (cf. *C.A.*, **34**, 463). In 58 of these cases the nicotinic acid excreted in the urine was either below 1.2 mgm. daily, which is considered as the lowest normal limit, or none. Four cases of pellagra in connection with insanity were cured by nicotinamide. The theory of Stepp, Kühnan and Schroeder (*C.A.*, **34**, 2899) concerning the excretion of nicotinic acid not only as such but also as cozymases nicotinic acid and trigonelline is discussed.

V. ASCHEHONG (Chem. Abstr.).

Experimental Avitaminosis of the B₂-complex Group and Pellagra of Man. Efremov, V. V. [*Acta Med. U.R.S.S.*, **2**, 622-31 (1939) (in English); cf. *C.A.*, **35**, 165^a.]

A comparative study of lesions of the skin, mouth and tongue in rats caused by the absence of vitamin B₂ from the diet, and of lesions in dogs and monkeys caused by the absence of nicotinic acid, shows that the most similar lesions occur in avitaminosis B₂ in rats and pellagra in man. Skin affections in dogs and monkeys are significantly different from pellagic erythema in man. The greatest resemblance is found in nervous lesions.

FELIX SAUNDERS (Chem. Abstr.).

Nicotinic Acid Metabolism. III, Metabolism and Synthesis of Nicotinic Acid in the Rat. Huff, Jesse W., Perlzweig, Wm. A., Forth, Rachel, and Spilman, Frances. [*J. Biol. Chem.*, **142**, 401-16 (1942); *cf. C.A.*, **36**, 1361⁹.]

The chief end product of nicotinic acid (I) metabolism in the rat is trigonelline (II), as it is in man and in the dog. On a diet providing about 5 gm. of protein (from casein and corn meal) an adult rat of 250-350 gm. excretes on the average 120 γ of (I) and its derivatives (including 100 γ as (II) in the urine). This amount corresponds closely to the intake of (I) in the food. After five days of fasting the total daily excretion of (I) in the urine dropped to 90 γ . (II) when administered orally in 1.5 mgm. doses is excreted unchanged in the urine to the extent of 20-40 per cent., which is much less than the proportion excreted by man, the dog, or the rabbit. The fate of the rest of the (II) remains undetermined. Nicotinuric acid (III) when administered orally in doses equivalent to 1.5-3.0 mgm. of (I) is excreted partly unchanged, but a substantial part appears as free (I) and (II). The rat, unlike the other species studied, possesses a mechanism for splitting (III). Nicotinamide (IV) given orally in 1.5 mgm. doses is excreted in the urine to the extent of 30 per cent. in 24 hours largely as (II). A small amount appears unchanged as (IV). (I) fed in 3 mgm. doses is excreted in the 24-hour urine also to the extent of about 30 per cent. of the ingested dose, of which 70-80 per cent. is (II), the remainder consisting of unchanged (I) and small amount of (III) and (IV). The simultaneous administration of large amounts of glycine with (I) does not increase (III) excretion. On a protein-free diet containing 7 γ of (I), adult rats excrete daily a total of 25-75 γ of derivatives of (I) in the urine, and 40-90 γ in the feces. On the addition of casein, amino acids (glycine and dl- δ -amino-n-valeric acid) or choline to the protein-free diet, the urinary, but not the fecal, excretion of (I) derivatives promptly and significantly increases, and decreases to the original level on the withdrawal of the nitrogenous compounds. These results are obtained after the parenteral as well as the oral administration of the N compounds. NH_4 lactate given intraperitoneally also increases the excretion of (I). These observations may be interpreted as evidence for the synthesis of (I) in the tissues of the rat, apart from any bacterial synthesis in the gut. After massive doses of (I) (1 gm. per kgm.) are fed for seven days to adult rats, two-thirds of the total amount administered can be recovered from the urine, while insignificant amounts are found in the feces and stored in the bodies. The one-third of the (I) thus unaccounted for cannot be found in the other nitrogenous components of the urine. FELIX SAUNDERS (Chem. Abstr.).

The Effect of a Nicotinic Acid Deficiency upon the Coenzyme I Content of the Human Erythrocyte and Muscle. Axelrod, A., et al. [*J. Biol. Chem.*, **138**, 667 (1941).]

In varying stages of pellagra the coenzyme I content of erythrocytes does not increase significantly. The average values for the coenzyme I content per ml. of erythrocytes in 45 controls and 31 subclinical, 17 mild and 5 severe pellagrins were 85, 77, 69 and 70-90 γ . The average values for striated muscle were 382 (9 subjects), 317 (11), 258 (14), and 214 (5) γ per gm. of fresh muscle respectively. In general the enzyme content decreases as the deficiency becomes more severe, but the precise physiological significance of the lowering of the coenzyme I content of muscle cannot at present be evaluated. Marked increases followed the administration of nicotinic acid in both erythrocytes and muscle. In the one patient studied, coramin therapy was without effect. Pyrazinemonocarboxylic acid when administered to three patients caused an increase in the coenzyme I content of the erythrocytes of one patient and of the muscle of another. All three compounds, however, brought about a definite improvement in the clinical condition of the pellagrins, indicating that the antipellagric value of a compound is not necessarily associated with its ability to affect the coenzyme I content of the tissues. Of the four compounds tested (pyrazinemonocarboxylic acid, quinolinic acid, coramine, and nicotinic acid amide) only the latter effected a synthesis *in vitro* of coenzyme I in defibrinated blood. A. P. LOTHROP (Chem. Abstr.).

Nicotinic Acid. The Nutritional Effects of Inhibitory Factors in Food. Clark, Alfred. [*J. Trop. Med. Hyg.*, **44**, 126-9 (1941).]

Summary: "Adequacy" of any essential factor such as nicotinic acid (I) or riboflavin (II) is not dependent upon the gross amount present but upon the available amount after a due allowance has been made for so much as may have been rendered inactive by any inhibitory factors, such as HCN, present in the food or produced in the organism by faulty protein metabolism. Unless the diet is correct temporary relief only is afforded by giving (I) or (II) in pellagra or the affection of the mucous membranes respectively. MARK PLUNGUAN (Chem. Abstr.).

Synthesis of Nicotinic Acid by the Rat. Dann, W. J. [*J. Biol. Chem.*, **141**, 803-8 (1941); *cf. C.A.*, **34**, 7365¹.]

New evidence that rats synthesize nicotinic acid (I) is presented in direct analysis of tissues for (I). Weanling rats with an average of 410 γ of (I) per liver gained 880 γ of (I) on a diet containing a total of 550 γ . The total (I) synthesized in the body of the rat in four weeks varied from 4.5 to 6.0 mgm. To determine whether intestinal bacteria synthesized (I), sulfaguanidine was given, greatly reducing the number of bacteria as well as growth, but addition of (I) to the

diet failed to promote growth. This indicated that little (I) originated in the intestine. Since the rat can synthesize (I), this factor is not a vitamin for the rat.

WILLIAM F. BRUCE (Chem. Abstr.).

A Clinical Method for the Determination of Nicotinic Acid in Blood and Urine. Stolz, Elmer. [J. Lab. Clin. Med., **26**, 1042-6 (1941).]

The method is based on the color reaction given by pyridine derivatives with CNBr and aromatic amines. The determination was made on a tungstic acid blood filtrate which was hydrolyzed with HCl or urine heated with NaOH for 30 minutes to free the acid. A saturated solution of p-aminophenol ("metol") in acid phosphate solution was used as the coupling agent. With the Coleman DM photoelectric spectrophotometer a linear relation between the light absorption and the concentration of nicotinic acid at wave length 400 m μ . was obtained if the colors were read one hour after their development. During this period the solutions were kept in the dark. A photoelectric colorimeter with filter can be used instead of the spectrophotometer. Duplicate analyses of a specimen of blood gave results that were reproducible within 6 per cent. When nicotinic acid in saline was added directly to blood at concentrations between 0.3 to 1.5 mgm. per cent. the recovery was at least 92 per cent.

HOWARD W. ROBINSON (Chem. Abstr.).

A Bacterial Assay Method for Nicotinamide and Related Substances in Blood, Urine and Spinal Fluid. Isbell, Harris, Wooley, Jerald G., Butler, R. E., and Sebrell, W. H. [J. Biol. Chem., **139**, 499-510 (1941); cf. C.A., **32**, 9130¹.]

Details of a quantitative assay method for nicotinamide and related substances in biological fluids with the use of *Shigella paradysenteriae* (Sonne) are presented. The method is sensitive to several hundredths of a γ of nicotinamide and related compounds and the values obtained are reproducible to within ± 10 per cent. Assays can be carried on with as many as 40 specimens at one time and as many as 120 assays can be made in a week. The results are expressed in terms of " γ equivs. to nicotinamide," because the organism responds not only to nicotinamide but also nicotinic acid, nicotinuric acid and a number of other related compounds, so that the value obtained can be taken only as a relative and not as an abstract measure of nicotinamide. Eleven normal men excreted 1,800 to 4,000 " γ equivs." per day and 9 apparently healthy female inmates of a mental institution 1,090 to 4,970. Twelve normal dogs eating a stock diet excreted 335 to 1,095 " γ equivs." The blood level of 66 healthy female mental patients and 11 normal dogs varied between 590 and 930 and 649 and 1,240 " γ equivs." per 100 ml. of blood respectively. The spinal fluid of 10 female mental patients and of 6 healthy dogs varied between 8 and 12 and 12 and 35 " γ equivs." per 100 ml. of spinal fluid respectively.

A. P. LOTHROP (Chem. Abstr.).

The Nicotinic Acid Content of Blood and Urine. Bandier, Erik. [Acta Med. Scand., **107**, 62-79 (1941); cf. C.A., **34**, 3299.²]

Nicotinic acid, like riboflavin, is a component of the "cyanide insensitive" enzyme complex. The nicotinic acid is contained in the codehydrogenases. For its determination in blood, pipet 5 c.c. into a 50-c.c. glass-stoppered flask containing 35 c.c. H₂O. Deproteinize with 5 c.c. each of 10 per cent. Na tungstate and 2/3 N NH₂SO₄. Centrifuge, measure 30 c.c. of clear solution into a beaker and heat with 5 c.c. 10 N NaOH for 90 minutes on a water bath. Adjust the pH to about 6 by adding concentrated HCl from a microburet (about 4 c.c.), transfer to a 30 c.c. volume flask containing two crystals of KH₂PO₄ and diluted to volume. Now transfer 15 c.c. to a 20-c.c. volume flask, heat 5 minutes on a water bath at 75-80°, add 1 c.c. freshly prepared CNBr solution, again heat 5 minutes, cool and add metol (Agfa). Leave for one hour in the dark, centrifuge and examine in the step-photometer (filter S 43, 50 mm. thickness). The extinction coefficient bears a linear relation to the quantity of nicotinic acid (0.888 for 0.1 mgm. in 10 mm. thickness). The nicotinic acid content of blood of newborn infants was, on the average, 0.43 mgm. per cent.; of children 5-10 years old 0.37 mgm. per cent.; of adults (20-35 years) 0.37 mgm. per cent., and 0.39 mgm. per cent. (over 50 years); in pregnant women 0.27 mgm. per cent. The nicotinic acid excretion for 24 hours was 1.20, 2.45 and 2.50 mgm. in the three age-groups respectively. Data are also presented on blood nicotinic acid and urinary excretion in a variety of patients. Very low values were found in two cases of stomach cancer, showing no clinical symptoms of pellagra, and in pernicious anemia.

S. MORGULIS (Chem. Abstr.).

Deproteinizing Reagent for Blood and Cerebrospinal Fluid Chemistry: Supplement I. Krautman, B. [Am. J. Clin. Path., Tech. Suppl. 5, **67** (1941).]

Place 23.8 gm. of Na pyrophosphate and 50 c.c. of metaphosphoric acid (5.6 gm. glacial HPO₃ in 1,000 c.c. of water) in a 1,000 c.c. Erlenmeyer flask. Add very slowly with shaking 29 c.c. of concentrated H₂SO₄ (sp. gr. about 1.84), cool to 40°, add 370 c.c. of 30 per cent Na₂WO₄, heat and mix until clear. Cool and make to 1,000 c.c. with water. Store in a dark bottle with a rubber stopper. For a working reagent dilute this stock reagent 1:10 with water. To each c.c. of sample to be deproteinized, add 9 c.c. of the working reagent; mix and filter when brownish.

Supplement II. [*Ibid.*, 70.]

The reagent prepared as above may be dried as follows: Evaporate almost to dryness on a water bath and dry completely in an oven at 100°–110°. Pulverize in a mortar and dry to constant weight in a desiccator. It should be pale green; if pale yellow it probably contains H_2WO_4 and should be discarded. For use dissolve 17 gm. in 200 c.c. of hot water and make up to 1,000 c.c. By varying this concentration the solution can be made to deproteinize various body fluids for the determination of such compounds as urea, nonprotein N, sugar or uric acid.

JOHN T. MYERS (Chem. Abstr.).

The Diagnostic Value of the Takata-Ara Reaction in the Cerebrospinal Fluid. Szanto, P. B., and Burack, S. [*J. Lab. Clin. Med.*, 26, 1079 (1941).]

From the examination of 314 patients, including 167 treated cases of paresis, the conclusion is made that the Takata-Ara reaction in cerebrospinal fluid is of great value in the diagnosis of syphilis of the C.N.S. It shows an absolute parallelism to the Au sol reaction and is more sensitive than the Ross-Jones reaction. The strongly positive reactions are associated with the lowest albumin-globulin ratios and the weakly positive reactions with higher ratios.

H. W. R. (Chem. Abstr.).

The Diagnostic Value of the Colloidal Carbon Flocculation Test in Spinal Fluid. Szanto, Paul B., Burack, Samuel, and Kreisler, Oscar. [*J. Lab. Clin. Med.*, 26, 1349–51 (1941); *cf. C.A.*, 35, 4091¹.]

The colloidal C. flocculation test (Schube and Harms, *C.A.*, 27, 1047) was positive in 90.4 per cent. of 156 cases of general paresis with a positive Wassermann reaction in the spinal fluid. The test is more sensitive than the Au sol and the Takata-Ara tests.

H. W. ROBINSON (Chem. Abstr.).

The Colloidal Gold Curve in the Aqueous Humor of General Paralytics. Orlando, R., and Gambino, L. R. [*Rev. asoc. med. Argentina*, 53, 604 (1939).]

The aqueous humor of general paralytics 1–4 hours after death flocculates a sensitive Au sol in Lange's reaction in the zone of specificity, that is, in the first tubes on the left. The determination of the albumin-globulin quotient also shows the relation of the aqueous humor and the cerebrospinal fluid, as does this parallelism in the colloidal reactions of the two fluids.

R. YABLONSKY (Chem. Abstr.).

Acetone Content of Blood and Cerebrospinal Fluid of Newborn Infants. Okuda, S. [*J. Oriental Med.*, 29, 86 (1938).]

Serum ketone of 21 normal newborn infants was 0–10 mgm. per cent.; cerebrospinal fluid-ketone content was 0–28 mgm. per cent.

B. C. P. A. (Chem. Abstr.).

Total Fat Content of Blood and Cerebrospinal Fluid of Newborn Infants. Okuda, S. [*J. Oriental Med.*, 29, 85 (1938).]

Total fat content of serum of 28 newborn infants was 400–1,000 mgm. per cent., that of the cerebrospinal fluid 20–90 mgm. per cent. There was no relation to age.

B. C. P. A. (Chem. Abstr.).

Iodic Acid Number of Blood and Cerebrospinal Fluid of Newborn Infants. Okuda, S. [*J. Oriental Med.*, 29, 84 (1938).]

HIO_3 number in serum of 29 infants less than one year of age was 0.08–0.17 c.c., that in cerebrospinal fluid was 0.017–0.050 c.c. There was no relation to age.

B. C. P. A. (Chem. Abstr.).

Contents of Non-protein-Nitrogen in Blood and Cerebrospinal Fluid of Newborn Infants. Okuda, S. [*J. Oriental Med.*, 29, 82 (1938).]

Serum non-protein-N of 29 normal infants aged less than one year was 18.7–42.5 mgm. per cent.; in cerebrospinal fluid it was 12–37 mgm. per cent. It was higher in newborn babies.

B. C. P. A. (Chem. Abstr.).

Sugar in Blood and Cerebrospinal Fluid of Newborn Infants. Okuda, S. [*J. Oriental Med.*, 29, 82 (1938); *cf. C.A.*, 33, 717².]

Blood sugar of 30 normal newborn infants was smallest on the day of birth (less than 70 mgm. per cent.), but increased gradually to 80 mgm. per cent. two weeks after birth and reached 190 mgm. per cent. after one year. Cerebrospinal fluid sugar of the same infants was highest on the day of birth (70–80 mgm. per cent.), but decreased to 40–60 mgm. per cent. after two months.

B. C. P. A. (Chem. Abstr.).

The Relation Between the Hemato-encephalic Barrier and the Psychic Condition. Lokshina, E. S. [*Trudy Nauch.-Issledovatel. Inst. Fiziol.*, 3, 149–63 (1938); *Chem. Zentr.*, 1939 (11), 3133.]

The cerebrospinal fluid of patients with various mental diseases was examined. A relation-

ship could be established between the sugar values in the fluid and the K : Ca coefficients of conditions of depression and other psychoses. M. G. MOORE (Chem. Abstr.).

The Influence of the Vegetative Nervous System on the Condition of the Hemato-encephalic Barrier in Cases of Sleeplessness. Voskresenskiĭ, N. S., and Lokshina, E. S. [*Trudy Nauch.-Issledovatel. Inst. Fiziol.*, **3**, 164-77 (1938); *Chem. Zentr.*, 1939 (11), 3441.]

Injection of insulin and lack of sleep for 24 hours had analogous effects on the contents of the blood and of the cerebrospinal fluid in sugar, K, inorganic P and Ca, the changes being in the direction of a slight displacement of the hemato-encephalic barrier.

M. G. MOORE (Chem. Abstr.).

The Reagin Content of Spinal Fluid. London, McKinley. [*J. Allergy*, **12**, 244-5 (1941).]

Reagins could not be demonstrated in the spinal fluid of atopic individuals who had high concentrations of reagins in the blood.

J. H. LEWIS (Chem. Abstr.).

The Relation Between Diencephalo-pituitary System and Thyroid Investigated by the Modification of the Influence of Spinal Puncture on the Metabolic Rate. Roncoroni, Cesare, and Casacci, Adriano. [*Riforma méd.*, **56**, 306-12 (1940).]

Spinal puncture causes an increase in metabolism within 30 minutes. The change is the more conspicuous the higher the initial metabolism was. Return to normal occurs within 24 hours. Puncture without withdrawal of fluid has no effect. Theory: Changes in spinal pressure influence the third ventricle with repercussion in the diencephalic nuclei.

A. E. MEYER (Chem. Abstr.).

The Cerebrospinal Fluid Total Protein in the Alcoholic Psychoses. Rosen, S. R. [*Am. J. Med. Sci.*, **201**, 270-7 (1941).]

In alcoholism, when psychopathy was present, the cerebrospinal fluid usually contained abnormal amounts of protein. This is attributed both to increased permeability of the hemato-encephalic barrier and to pathologic catabolism of central nervous system tissue.

FERRIN B. MORELAND (Chem. Abstr.).

Objective Evaluation of the Electroencephalogram, with Special Reference to Relative Co-ordination. Hugger, H. [*Pflüg. Arch. ges. Physiol.*, **244**, 309-36 (1941).]

Van Holst's methods of statistical analysis of the phase relationships of the alpha rhythm were applied to more than 100 persons, including normals and those with brain lesions. The results show that with this method phase co-ordination of different areas can be proved, and that continuous registration of the duration and amplitude of the phases allows conclusions as to the distant influencing rhythms. The periodical variations in occipital alpha rhythm lead to the conclusion that these are influenced by other rhythms, perhaps subcortical. The mechanism of this co-ordination is unknown. The influenced rhythm is the slower. An attempt was made to deduce the frequency of the influencing rhythms from the difference in frequency of the alpha rhythm and the periodical variations, which in the healthy adult (awake) are 6-8 per second. Patients with brain lesions show greater variations in the duration and amplitude of the phases.

M. E. MOORE (Psychol. Abstr.).

The Effects of Alcohol upon the E.E.G. Davis, P. A., et al. [*Quart. J. Stud. Alc.*, **1**, 626 (1941).]

Only very small deviations from normal were seen in E.E.Gs. of chronic alcoholics receiving no alcohol, and in those of normal young men acutely intoxicated by ingestion of 2 c.c. of 100 per cent. alcohol (mixed with fruit juice and sugar) per kgm. body-weight.

M. HORN (Chem. Abstr.).

Electroencephalographic Studies: Slow Activity during Hyperventilation in Relation to Age. Liberson, W. T., and Strauss, H. [*Proc. Soc. exp. Biol. N.Y.*, **48**, 674-76 (1941).]

Two hundred electroencephalograms of patients with (1) idiopathic epilepsy, (2) symptomatic epilepsy, (3) headaches, fainting, dizziness, (4) organic diseases of the brain are analysed. It is shown that "there is a definite relationship between the age and the amount of slow activity during hyperventilation in epileptic and non-epileptic patients. An analogous relationship to age was found for the spontaneous delta activity of patients with idiopathic epilepsy."

H. PEAK (Psychol. Abstr.).

Results of Experiments on Electroencephalography. Cate, J. ten, Waller, W. G., and Koopman, L. J. [*Ned. Tijdschr. Geneesk.*, **84**, 4899-4906 (1940).]

Records from normal animals were compared with records from animals after extirpation of occipital cortex or total neopallium. Alpha waves were found to originate in other parts of the cortex as well as in the occipital region, and even in subpallial structures, though to a lesser degree. However, no alpha waves could be obtained as far down as the cerebellum or the mesencephalon. The belief is expressed that those alpha waves which are recorded from the skin of the skull originate only in the cortex.

E. S. PRIMOFF (Psychol. Abstr.).

Electroencephalographic Study of the Adaptation Mechanism of the Central Nervous System. Moto-kawa, K., and Tosisada, M. [*Jap. J. med. Sci., Biophys.*, **7**, 213-33 (1941).]

With a large plane under continuous uniform illumination as stimulus, occipital alpha waves were suppressed. Recovery-time depended on stimulus intensity; 90 per cent. recovery occurred for 0.06 Lux in 43 seconds, for 0.2 Lux in 51 seconds, for 1.3 Lux in 59 seconds, and for 2.7 Lux in 63.5 seconds. At 5.8 Lux recovery reached only 63 per cent., and at 10.8 Lux no recovery was observed. Adaptation was delayed by lack of homogeneity in the visual field. Activity which diverted the attention of the visual field, such as mental arithmetic or auditory stimulation, expedited recovery of the waves. E. S. PRIMOFF (Psychol. Abstr.).

Contribution to the Physiology of the Experimental Neuroses. Petrova, M. K. [*Acta Med. U.R.S.S.*, **2**, 444-50 (1939).]

Over 25 years ago Jerofejeva conditioned the salivary reflex to electric stimulation of the skin. One dog was able to suppress the unconditioned defense reflex to the electric stimulus only when the electric stimulus was limited to a small skin area. With the stimulation of larger areas the CR disappeared in favour of the UCR. This dog had become useless for further experiments. On this basis the author made further experiments with dogs. In a situation with fear as the unconditioned response three phases in the suppression of the UCR are distinguished; the adapted phase, in which the strength of the reaction corresponds to the strength of the stimulus; the paradoxical phase, in which the reaction is exaggerated in comparison with the stimulus; and the ultra-paradoxical phase, in which, in addition, the negative stimulus is followed by a positive reaction and the positive stimulus by a negative reaction. In one dog the last phase lasted over ten years. Neuroses may be cured by rest, hypnotic and narcotic sleep, and bromide and other drugs.

H. L. ANSBACHER (Psychol. Abstr.).

Modification of Resistance to Anoxia, with Special Reference to High Altitude Flying. Barach, A. L., Eckman, M., and Malomut, N. [*Amer. J. med. Sci.*, **202**, 336-41 (1941).]

Emotional control and judgment are impaired by relatively mild degrees of anoxia, and there may be a connection between "pilot error" and continuous anoxia at 12,000 ft. Military flying is conducted at altitudes (40,000 ft.) so high that anoxia occurs even with inhalation of 100 per cent. oxygen. This paper deals with aggravation of anoxia by CO poisoning from inhaling tobacco smoke, and increased resistance to anoxia after thyroidectomy. Carbon monoxide poisoning may impair resistance to anoxia when a pilot is travelling without oxygen at 10,000-12,000 ft., and with 100 per cent. oxygen at 34,000-40,000 ft. In 18 inhaling smokers the average CO saturation of arterial blood (under room conditions) was 5.7 per cent. after smoking 20 cigarettes between 9 a.m. and 4 p.m.; in nine subjects it was 5-10 per cent. Thyroidectomized rats show remarkable resistance to continuous exposure to low oxygen concentrations. Probably pilots with a low basal metabolism would withstand very high altitudes better than pilots with a low rate, and possibly methods may be found to reduce basal metabolism temporarily.

M. E. MORSE (Psychol. Abstr.).

Cholinesterase Activity and Acetylcholine Content of the Central Nervous System. Cortell, R., Feldman, J., and Gellhorn, E. [*Amer. J. Physiol.*, **132**, 588 (1941).]

Experiments on unanaesthetized rabbits show that neither prolonged anoxia, hypoglycemia, nor convulsions alter the acetylcholine content (I) and the cholinesterase activity (II) of hemisphere and brain stem. Intravenous injection of eserine (0.5 mgm./kgm.) markedly inhibits II and increases the I of the brain. The effects are reversible with time. Neither convulsions nor O lack alter I and II in eserinated rabbits. In frogs strychnine convulsions are accompanied by a marked increase in I of the brain and spinal cord. There is no significant alteration in II. When frogs are warmed to 38° or higher a comatose condition appears. The central nervous system of such animals shows a decrease in both I and II. When the heated frogs are allowed to recover they show, together with a restoration of nervous-system function, a return of II and I to approximately normal levels. E. D. WALTER (Chem. Abstr.).

Chemical Changes in the Brain Produced by Injury and by Anoxia. Stone, W. E., Marshall, C., and Nims, L. F. [*Am. J. Physiol.*, **132**, 770 (1941).]

The effects of cerebral injury and of cerebral anoxia on the cortical pH and electrical activity and on the concentration of lactic acid, inorganic phosphate, phosphocreatine, pyrophosphate and hexose phosphates of the cerebral cortex were studied. E. D. WALTER (Chem. Abstr.).

Carbohydrate Metabolism in the Central and Peripheral Nervous System. Epel'baum, S. E. [*Biochem. J. (Ukraine)*, **15**, 449 (1940).]

While muscle tissue was the principal subject for investigation, sufficient work was done on nerve tissues to give an indication of some stages of the metabolism. Epel'baum points out the labile nature of the substances involved and their rapid post-mortem decomposition. The accumulation of contradictory material shows the need for further investigation.

B. GUTOFF (Chem. Abstr.).

Glycolysis in the Brain of Animals of Various Ages. Epel'baum, S. E., and Skvirskaya, E. V. [*Biochem. J. (Ukraine)*, **15**, 233 (1940).]

The glycolytic activity of the brain was investigated by incubating it for two hours in a P buffer, pH=7.04-7.1, with 0.4 per cent. glucose. Newborn and embryo rabbits in the final stages of development showed the highest lactic acid formation, 3016 mgrm. per cent. This activity dropped to 1879 in 5-7-day-old and to 1329 in 12-22-day-old rabbits. From 30 days on the lactic acid begins to approach that of an adult—1002 mgrm. per cent. The glycolytic activity closely corresponds to changes in the P compounds, and the gray matter, with its high glycolytic activity, predominates in the early stages of growth. B. GUTOFF (Chem. Abstr.).

The Swelling of Brain Tissue Fixed with Formalin. Watanabe, R. [*Mitt. med. Akad. Kioto*, **29**, 751 (1940).]

Bovine brain tissue was fixed in 10 per cent. formalin for seven days, washed in running distilled water for five days and then immersed in various solutions. The swelling of the tissue as estimated from the daily change in weight increased in the order—CaCl₂, MgCl₂, LiCl, NaCl, KCl, HCl, NaOH for 0.1 N. solutions; LiCl, NaCl, KCl, MgCl₂, CaCl₂, HCl, NaOH for 0.01 N. solutions. RUTH BERGGREN (Chem. Abstr.).

The Ester-hydrolyzing Activity of the Central Nervous System. Cohn, D. J., Kaplan, J., and Janota, M. [*J. Lab. Clin. Med.*, **26**, 1017 (1941).]

The various tissues of the brain and spinal cord of monkeys (*Macaca mulatta*) have tributyrin- and ethyl butyrate-splitting activity that was approximately 10 times that of blood serum. Neutral fat (olive oil) was not appreciably hydrolysed. Substrate emulsions were prepared by shaking 1 part of substrate with 4 parts of a 5 per cent. solution of gum acacia. The hydrolysis mixtures made up in 50 c.c. glass-stoppered Erlenmeyer flasks contained 2 c.c. of emulsion, 1 c.c. or more of a phosphate buffer solution, and distilled water to bring the volume to 10 c.c. The amount of buffer was varied to study its influence on the activity. Within certain limits increase in buffer concentration was accompanied by increased hydrolysis, reaching a maximum at 0.02 to 0.05 M phosphate concentration for ethyl butyrate and 0.16 M for tributyrin. The activity was determined at pH 7.9, which is in the range of maximum hydrolysis of these substances. The flask containing the weighted fresh minced tissue was shaken vigorously until the tissue was distributed in small pieces and then incubated for 24 hours at 37°. The reaction was stopped by the addition of 10 c.c. of 95 per cent. alcohol, and the amount of acid formed was determined by titration with 0.05 M NaOH with 10 drops of a 1 per cent. solution of phenolphthalein as indicator. A substrate blank and a tissue blank were determined. The tributyrin-splitting power was greatest in the cerebral cortex, least in the white matter and intermediate in mixed areas. Mixed tissues rich in gray matter, such as the thalamus and the cerebellum, were more active than mixed tissues rich in white matter such as the stem and spinal cord. The ethyl butyrate-splitting activity was greatest in the cerebral cortex and least in the spinal cord. The cerebellum had less activity than other mixed tissues, including stem. White matter was less active than gray or mixed tissues with the exception of the spinal cord. These differences were found in all animals studied. H. W. ROBINSON (Chem. Abstr.).

The Structural Physiology of Nerve Fiber. Trurnit, H. J. [*Naturwissenschaften*, **28**, 476 (1940).]

It is evident from the measurements of Thiessen *et al.* that the bioelectric potential carried by the nerve cell wall, alleged to be of the order of 10⁵ volts per cm., can actually exist on the two sides of a unimolecular lipid layer without breakdown.

B. J. C. VAN DER HOEVEN (Chem. Abstr.).

Microchemical Studies on the Nervous System. IV. Nitrogen Compounds of Nerve during Degeneration. May, R. M., and Arnoux, J. [*Bull. Soc. chim. biol.*, **22**, 286 (1940).]

In dogs the sciatic nerve was cut and examined 1-3 weeks later. The water and total N contents increased. Lipide N decreased about 50 per cent., alcohol soluble N insoluble in Et₂O or C₆H₆ increased 122 per cent., water-soluble N decreased 55 per cent. and protein N increased 27 per cent. The decrease in lipide N indicates degradation of axones and myelin. The increase in protein N is probably due to multiplication of Schwann cells and invasion of white corpuscles. L. E. GILSON. (Chem. Abstr.).

Whooping-cough Meningoencephalitis. I. Alteration of the Central Nervous System after Injection of the Soluble Exotoxin, the Endotoxin and the Emulsion of the Whooping-cough Bacilli into the Subarachnoid Space of the Rabbit. Nakamura, T. [*Mitt. med. Akad. Kioto*, **28**, 596 (1940).]

Upon injection of the soluble exotoxin of the whooping-cough bacillus into the subarachnoid space, the respiratory frequency was greatly accelerated and the rabbits became delirious. Various signs of irritation of the meninges and brain disappeared slowly after 5-10 mins. However, in 8-24 hours the animals again became prostrate, and rigidity and paralysis of the extremities, nystagmus, rigidity of the neck and other symptoms of disease appeared; the animals soon died in paralysis. Dilatation of the blood vessels of the cerebral parenchyma, infiltration of the perivascular polynuclear cells and small hemorrhage from destruction of the blood vessels

occurred. In several cases adhesion of the cerebral parenchyma with the pia mater was evident. The fine nerve fibers exhibited fragmentation. The deep nerve fibers showed an increase in the Ag affinity, porosity of the edges and nodular swelling. In the macroglia cells directly under the meninges or in the vicinity of the cerebral ventricle only regressive changes were noted. The microglia cells in the superficial portion of the cerebral cortex or in the section of the cornu ammonis underwent diffuse proliferation, while in the lower portion of the cerebral meninges, in the ganglion cells or in the portion of the brain with hemorrhages they showed circumscribed glial proliferation, formation of glia nodules and neuronophagia. Morphological changes, especially numerous so-called fatty granular cells with center of the hemorrhages, were often evident as regressive changes. The changes in the oligodendroglia cells were generally similar to those in the microglia cells; they showed proliferation chiefly in the vicinity of the ganglion cells, and swelling of the cells and disappearance of the process. If the endotoxin of the whooping-cough bacillus was injected into the subarachnoid space in a second group of rabbits, the toxic action on the nerve tissue was smaller than above, while the less distinct changes in both groups showed no characteristic differences. In a third group of rabbits which had received an emulsion of the whooping-cough bacillus, the clinical picture and the pathological-histological picture of the brain showed a very acute and extremely severe course. Marked regressive changes were noted in every part of the central nervous system. There was also an active proliferation of the glia cells which was remarkably intense compared with that in the first two groups. The so-called "soluble exotoxin" of the whooping-cough bacillus presumably plays an important role in the development of the whooping-cough meningoencephalitis; its significance here is greater than that of the endotoxin of the whooping-cough bacillus.

II. The Mechanism of the Development of the Whooping-cough Meningoencephalitis in the Rabbit with Experimental Whooping-cough Bacteremia. [Ibid., 598.]

The emulsion of whooping-cough bacilli was injected into the ear vein of a rabbit whose liver function had been damaged by CCl_4 . The rabbit was kept in a thermostat usually at 37° but occasionally above 50° . Loss of appetite, diarrhoea, congestion of the bulbar conjunctiva, slight rigidity of the neck, nystagmus or paralysis of the extremities appeared in some animals 12-20 days after the injection. In these animals the changes in the cerebrospinal fluid, as turbidity, distinct arachnoid formation, increase in the cells consisting chiefly of lymphocytes, increase in the protein content and a positive globulin reaction were those of meningitis. The macroscopic changes in the brain consisted of edematous swelling and turbidity of the pia mater and dilatation or hyperemia of the blood vessels, as well as dilatation or hyperemia of the blood vessels in the cerebral parenchyma and a dilatation of the cerebral ventricle. Infiltration of the polynuclear leucocytes into the pia mater and the vicinity of its blood vessels and into the cerebral parenchyma directly under the pia mater, or the cerebral cortex or in the vicinity of the cerebral ventricle was evident. The ganglion cells were irregularly shaped and stained, and shortening or disappearance of the processes occurred; these changes were marked in the surface of the cortex. Fragmentation or extensive swelling of the nerve fibers of the superficial portion of the cortex as well as fragmentation of the deeply situated nerve fibers was noted. The macroglia cells had proliferated chiefly directly under the cerebral meninges and in the vicinity of the cerebral ventricle, the blood vessel and the ganglion cells. Individual cells also showed morphological changes. The microglia cells revealed diffuse or circumscribed proliferation. Glia nodule formation, gliosis, neuronophagia and the transitional form of the fatty granular cells occurred. The changes in the oligodendroglia cells resembled those of the microglia cells. In rabbits with an experimental whooping-cough bacteremia a whooping-cough meningoencephalitis can be produced by injury of the liver function and artificial increase in body temperature. The assumption is probably justified that in children whose liver function has already been damaged by the whooping-cough bacilli or the toxin of the bacilli excessive heat or CO_2 may play an important role in the development of the meningoencephalitis.

RUTH BERGGREN (Chem. Abstr.).

Effect of Metabolic Inhibitors on the Resting Potential of Frog Nerve. Shanes, Abraham M., and Brown, Dugald E. S. [J. Cellular Comp. Physiol., 19, 1-13 (1942).]

Soaking sciatic nerves of *Rana pipiens* in iodoacetate, fluoride and phlorizin for about 16 hours at low temperatures reduces the resting potential and makes the remaining potential less sensitive to temperature increase and O lack than that of the controls upon return to normal temperatures. The effect of iodoacetate is completely counteracted by lactate and pyruvate in the presence of O. In N, however, this reversal does not occur, and the potential of metabolite plus-poison nerves falls faster than those of Ringer-soaked preparations and reaches the low level of iodoacetate-treated nerves. Fluoride can be counteracted by pyruvate in O, while lactate has no action at all. In N the pyruvate-supported potential falls rapidly to the magnitude of that of nerves in the inhibitor alone. In higher concentrations fluoride blocks pyruvate utilization as well. Phlorizin in lower concentrations is counteracted by pyruvate, but blocks its utilization in higher concentrations. Succinate, malate and fumarate are only slightly effective in counteracting iodoacetate, while malonate has no effect either on their utilization or on the potential. The oxidation of pyruvate in the presence of O is fundamentally concerned in the maintenance of potentials and probably involves phosphorylations. Lactate is converted

into pyruvate before utilization. In N, a phosphorylation occurring as the result of the breakdown of phosphopyruvate to pyruvate is instrumental in supporting the potential by virtue of the same mechanism through which pyruvate acts. Still another process, one insensitive to temperature change and to lack of O, also contributes to the resting potential.

FELIX SAUNDERS (Chem. Abstr.).

The Method of Direct Action on the Central Nervous System, especially on the Vegetative Centers of the Brain. Shtern, L. S. [*Acta Med. U.R.S.S.*, **2**, 384-91 (1939) (in French); cf. *C.A.*, **35**, 6669⁵.]

FELIX SAUNDERS (Chem. Abstr.).

The Myoneural Substance According to the Chemical Theory of the Transmission of the Nervous Impulse. Ginetsinskii, A. G. [*Acta Med. U.R.S.S.*, **2**, 425-36 (1939) (in French).]

The nature of the reaction of acetylcholine and eserine and the amount of cholinesterase present can be explained by the assumption that there is a difference in the degree of differentiation of two substances in the muscle. In muscular tissue with the greatest advance in evolution there is a strict spatial limitation characterized by (1) an absence of reaction to acetylcholine, (2) appearance of the eserine reaction and (3) a low cholinesterase content. In muscular tissue lower in the evolutionary scale where neuromuscular substance is more diffuse there are (1) sensitivity to acetylcholine, (2) the simplest type of reaction to eserine, and (3) a large amount of cholinesterase in extracts of muscle.

FELIX SAUNDERS (Chem. Abstr.).

Inositol—A Constituent of a Brain Phosphatide. Folch, Jordi, and Woolley, D. W. [*J. Biol. Chem.*, **142**, 963-4 (1942).]

Inositol was isolated from hydrolysed phosphatide from both brain and spinal cord. Various preparations contained from 6.8 to 8.6 per cent. meso-inositol.

FELIX SAUNDERS (Chem. Abstr.).

The Chemical Transformation of the Nervous Impulse. Pighini, G. [*Rass. Mens. Biol., Clin. Terap.*, **8**, 169 (1939).]

Chemical Factors of Nerve Stimulation in the Eating Reflex. Berger, E. N. [*Arch. sci. Biol. (U.S.S.R.)*, **51**, 73 (1938).]

Experiments on angiotomized dogs are reported. In 6-8 minutes after physiological stimulation by the sight or odor of meat an acetylcholine-like substance could be detected in the blood by means of tests on isolated frog heart or on physostigminized leech muscle. Physostigmine slows up the destruction of this compound.

W. A. MOORE (Chem. Abstr.).

Influence of Emotional Excitement on Insulin Content of Blood in Normal Subjects and Psychotic Patients. Gellhorn, E., Allen, A., and Feldman, J. [*Proc. Soc. Exp. Biol. Med.*, **46**, 572 (1941).]

The Metabolism of Cerebral Tissue, The Concentration of Oxygen and Warburg's Technique. Noyons, A. K. M., and van Goor, H. [*Acta Brevia Neerland. Physiol., Pharmacol., Microbiol.*, **10**, 99 (1940).]

Metabolic values obtained by the method of Warburg in the presence of an oxygen concentration of 100 per cent. are not the normal values.

E. CURZON (Chem. Abstr.).

Glucide Metabolism in Schizophrenia. Läfvendahl, H., and Valatin, T. [*Acta Med. Scand.*, **106**, 70 (1941).]

In a number of schizophrenics an increased amount of bisulfite-binding substance was found in the blood. The pyruvic acid of the blood in about half the cases studied showed an increase from the normal level of 0.4 mgm. per cent. to as high as 1.8 mgm. per cent. In a third of the patients the blood lactic acid was greater than the highest normal value of 20 mgm. per cent. The highest values were found in the catatonic and in the restless patients.

S. MORGULIS (Chem. Abstr.).

The Availability of Ethyl Alcohol for Human Brain Oxidations. Goldfarb, W., and Wortis, J. [*Quart. J. Stud. Alc.*, **1**, 268 (1940).]

In 11 schizophrenics in hypoglycemic coma produced by insulin therapy, the oral administration of 200 c.c. of 25 per cent. EtOH or (1 case only) the intravenous administration of 50 c.c. of 10 per cent. EtOH did not rouse the patients or change the oxygen uptake of the brain (as measured by analyses of the arterial and venous blood entering and leaving the brain). The results indicate that during insulin hypoglycemia the metabolic requirements of the brain cannot be supported by EtOH oxidation. It is suggested, however, that if adequate amounts of glucose were present in the brain, the alcohol could have been metabolized, since glucose was previously observed to accelerate alcohol oxidation in the body as a whole.

M. HORN (Chem. Abstr.).

Plasma Protein in Epileptics during Inanition. Eeg-Olofsson, R. [*Acta Med. Scand.*, **106**, 254 (1941).]

Inanition causes amelioration or even temporary disappearance of epileptic seizures. If the plasma proteins bear any relationship to epilepsy, the changes in plasma protein during inanition should give evidence of this. Studies were made on four males who for a period of 14 days received only weak tea and three oranges daily. The determinations were continued for a week after the inanition. Unfortunately, only total protein values are available for the pre-inanition period. Three of the patients showed the typical response to inanition. The fibrin was not affected during fasting, nor was there any noteworthy alteration to the total plasma proteins, but the albumin/globulin ratio was somewhat changed in favor of the albumin.

S. MORGULIS (Chem. Abstr.).

Glucose Oxidation in Normal and Epileptic Brains. Lennox, W. G., Gibbs, E. L., and Gibbs, F. A. [*Trans. Am. Neurol. Assoc.*, **66**, 81-3 (1940).]

Patients with *petit mal* tend to have a cerebral CO_2 production which is low in relation to O_2 consumption, or a glucose consumption which is low in relation to O_2 consumption. The average R.Q. of the brain was 0.99 among 23 healthy persons, 0.92 among 18 patients with *petit mal*, and 0.97 among 13 epileptic patients not subject to *petit mal*. When the number of mgm. of glucose lost from the blood in passage through the brain was divided by the volume per cent. of O_2 lost, the quotient was 1.48 for normal subjects, 1.08 for patients with *petit mal*, as compared with the theoretical quotient of 1.34 which would be obtained if only glucose was burned, and if glucose was completely burned. The results suggest that glucose metabolism is abnormal in the brains of patients with *petit mal*.

MARION HORN (Chem. Abstr.).

Regulation of Blood pH in Hyperpnea by Epileptic Patients. Favill, John, Avery, Loren, and Freeland, Minor. [*Trans. Am. Neurol. Assoc.*, **66**, 74-8 (1940).]

During overbreathing, when blood H_2CO_3 is decreased because of loss of CO_2 from the lungs, the normal person shows an elevation of blood pH which is compensated for by a fall in alkaline reserve of the plasma. During a rest period after overbreathing the blood pH falls markedly, so that after a second period of overbreathing, the final blood pH is only slightly higher than that at the start of the experiment. In 15 epileptic patients, on the other hand, overbreathing produced a marked rise in blood pH, with no compensatory fall in blood alkaline reserve. During the rest period the blood pH of the epileptic patients consequently remained high, and a second period of overbreathing caused an increase in pH which was summated on the first, and which frequently reached a level high enough to lead to a convulsion. The observations suggest that the unfavourable reaction of epileptic persons to alkalization is due to inability to compensate for loss of CO_2 because of impairment of the mechanism used for maintenance of acid-base equilibrium.

MARION HORN (Chem. Abstr.).

Amaurotic Family Idiocy. Jervis, G. A. [*Am. J. Dis. Child.*, **60**, 88-101 (1940).]

A case of late infantile amaurotic idiocy with megaloccephaly is described. Pathologically, typical lesions of amaurotic idiocy associated with extensive demyelination were found. Chemically there was a marked increase of lipins of the protagon fraction but no significant increase of sphingomyelin.

B. C. P. A. (Chem. Abstr.).

The Nature of Organic Acids in Brain Tissue. Epshteyn, Ya A. [*Biokhimiya*, **5**, 452-63 (1940).]

About 30 per cent. of the cations of the brain are in combination with organic acids of unknown nature, the so-called X-acids. The organic acids of the brain tissue of laboratory mice and cats were determined by electrometric titration. Of the 55 milliequivalents of organic acids found about half consists of the glycerolphosphoric or hexosephosphoric acid esters. The remainder consist largely of lactic acid.

H. PRIESTLEY (Chem. Abstr.).

The Effect of Adrenaline on Nerve Action Potentials. Büllring, E., and Whitteridge, D. [*J. Physiol.*, **99**, 210 (1941).]

The effect of adrenaline was studied on the excitability of the cat sciatic nerve *in situ*. In healthy nerve intra-arterial injection of 5-25 μg . adrenaline increases the height of the action potential produced by submaximal stimuli. This effect is due to a lowering of threshold; it lags behind and outlasts the vascular action of adrenaline. The effect of adrenaline is much larger when the nerve shows fatigue. The same doses of adrenaline reduce or abolish the δ spike in the action potential produced by maximal stimuli; this effect is attributed to the reduction of blood flow caused by the adrenaline.

E. D. WALTER (Chem. Abstr.).

Comparative Study of the Metabolism of the Infant and Adult Brain. Himwich, Harold E. [*Trans. Am. Neurol. Assoc.*, **66**, 111-13 (1940).]

The metabolism of the infant and adult brain was studied in the Warburg apparatus to compare the relative O_2 uptake and sensitivity to narcotics. The chief substrate of both infant and adult brain is glucose. In rats the O_2 uptake of the adult brain is highest in the cortex and lowest in the medulla, while that of the entire infant brain is approximately two-thirds that of the adult medulla. The infant rat brain was less susceptible than the adult rat brain to the

depressant effect of 0.012 per cent. pentobarbital on the respiration. In dogs, the metabolism varied in different parts of the brain in both adults and infants. In 4-day-old puppies the rate was highest in the medulla, intermediate in the caudate nucleus, lowest in the cerebral cortex. In grown dogs, the rate was lowest in the medulla, intermediate in the cerebral cortex, highest in the caudate nucleus. The oxygen uptake of the various parts is in accordance with the conception of a phylogenetic development of the layers of the brain.

MARION HORN (Chem. Abstr.).

The Nitrogenous Constituent of Cephalin. Blix, G. [*J. Biol. Chem.*, **139**, 471 (1941).]

Pure cephalin was subjected to both acid and alkaline hydrolysis with either EtOH or H₂O as a solvent, and in no instance was more than 25-50 per cent. of the total N distilled from the hydrolyzate as ethanolamine. The possibility that the unknown component is a near homolog of ethanolamine or some other related amine was excluded by the fact that the cephalin N which did not distil off at 10 mm. of Hg and 80° did not distil even at 160°. As all the N of cephalin is present as primary amino N, the findings indicate that the substance might be a hydroxyamino acid such as serine which is closely related to ethanolamine, as recently suggested by Folch and Schneider (*C.A.*, **35**, 1107). Fractions of cephalin least soluble in MeOH contain less ethanolamine than fractions somewhat more soluble in MeOH. This suggests a possible way for the separation of ethanolamine cephalin from amino acid cephalin by use of an organic solvent.

A. P. LOTHROP (Chem. Abstr.).

Thyroid and Brain Respiration. Rossiter, F. J. [*J. Endocrinol.*, **2**, 165 (1940).]

In the presence of glucose, Na pyruvate or Na succinate, brain pulp from thyroid- and thiamine-treated rats has a higher O uptake than pulp from controls that received thiamine alone. If no thiamine is given the increase is smaller with glucose and disappears with pyruvate. With dispersion preparations from similarly treated animals there is no increase in O uptake. Addition of thyroglobulin *in vitro* causes an increase in O uptake of pulp and dispersion preparations of rat brain with both glucose and Na pyruvate. This effect is considered to be distinct from that given above because of the dissimilarity of the time relations. Addition of thyroxine *in vitro* does not increase O uptake of pulp and dispersion preparations of rat brain in the presence of glucose or pyruvate.

F. SAUNDERS (Chem. Abstr.).

The Water Distribution in Certain Tissues of Encephalomalacic Chickens. Ni, T. G. [*Clin. J. Physiol.*, **15**, 493 (1940).]

In chicks maintained on a vitamin E-deficient diet the percentage of total water as well as "free" water of the cerebellum and of the left and right cerebral hemispheres increased in those cases where lesions of encephalomalacia were visible. In the same brain the hemispheres with severe lesions contained more water than those with moderate lesions. The increase was found to be mainly "free" water. The water content of the blood, kidney, stomach, etc., showed a wider range of variation in the encephalomalacic chicks than in those showing no visible lesions and apparently was not related to the state of hydration of the brain.

W. H. SEEGER (Chem. Abstr.).

Water Determination in Biological Objects. III. Determination of Water in Brain Tissue. Gurevich, V. G., and Karlson, L. E. [*Méd. exptl. Ukraine*, No. 1, 29 (1940).]

The method consists of extraction with alcohol and the subsequent determination of the water by the temperature at which turbidity of an alcoholic xylene-water mixture appears. A stronger concentration of alcohol was required for the water extraction of brain tissue as compared with that of blood. This method is 30-40 times as rapid as the desiccation technique.

S. A. CORSON (Chem. Abstr.).

Localization of Enzymes in Nerve Fibers. Nachmansohn, D., and Steinbach, H. B. [*Science*, **95**, 76-7 (1942); cf. *C. A.*, **35**, 1425⁴.]

About 90 per cent. of the total amount of succino-dehydrogenase of the giant nerve fiber of the squid is concentrated in the axoplasm. The concentration is about 50 per cent. lower in the sheath. In the head ganglion the concentration of succino-dehydrogenase is about ten times as high as in the fiber; whereas the concentration of cholinesterase is several hundred times higher than in the fiber. The concentration of cocarboxylase in the sheath is twice as high as in the axoplasm.

FELIX SAUNDERS (Chem. Abstr.).

Reaction of the Subcutaneous Tissues to the Acetone-insoluble Lipoids from Beef Brains. Tompkins, Edna A. [*Bull. Johns Hopkins Hosp.*, **70**, 55-80 (1942).]

The reactions to the various chemical fractions are the same in rabbits, guinea-pigs and mice and are specific for each chemical fraction. Phospholipides produce infiltrations of phagocytic mononuclear cells and are quickly absorbed without residual reaction; the phagocytic mononuclear cells produced by the ether-soluble phosphatides (lecithin and cephalin) differ morphologically from those produced by the ether-insoluble sphingomyelins. The galactolipides

(kerasin and phrenosin) stimulate irritative reactions characterized by infiltrations of granulocytes, poor absorption and encapsulation with connective tissue. The findings are discussed from the standpoint of the chemical relations between the lipoids, and the histopathology of Gaucher's and Niemann-Pick's disease.
Z. B. MILLER (Chem. Abstr.).

Myasthenia Gravis Complicated by Thyrotoxicosis; Creatine Studies; Case Report. Thorn, Geo. W., and Tierney, Nicholas A. [Bull. Johns Hopkins Hosp., **69**, 469-75 (1941).]

A female patient, aged 45, with myasthenia gravis, hyperthyroidism and rheumatic valvular heart disease was given combined prostigmine and guanidine-HCl therapy with only temporary improvement. The patient showed spontaneous creatinuria and decreased tolerance to administered creatine. Creatine excretion showed a sharp drop after treatment with Lugol's solution (1 c.c. three times daily); the basal metabolic rate also decreased slightly, and the patient's general condition improved somewhat. Subtotal thyroidectomy caused marked improvement.
ZELMA BAKER MILLER (Chem. Abstr.).

Changes of the Chemical Properties of Sterols in Cerebral Diseases. Gorizontov, P. D. [Biokhimiya, **5**, No. 1, 102-113 (in German, 113-114) (1940).]

Spectrophotometric investigation showed in dogs with meningoencephalitis a derivative of the dehydrocholesterol type, with the absorption peak at 282 m., and one of the cholesterol type, with the absorption peak at 292-5 m. This finding indicates that there is an intensification of the metabolic processes in the cerebrum affected by meningoencephalitis. The sterols of the blood resemble to a certain extent the cerebral sterols in their chemical compositions. This is a direct proof of the effect of the cerebrum on the composition of blood sterols. Oxycholesterol was not detected in either normal or pathological cerebrum.
W. R. HENN (Chem. Abstr.).

Observations on the Carbohydrate Metabolism of Brain Tissue, with Special Reference to the Potassium Effect. Kimura, Yukiti. [Sci. Papers Inst. Phys. Chem. Research (Tokyo), **38**, 387-400 (1941); cf. C. A., **35**, 495².]

The experiments were done with rabbit brain slices. In the presence of KCl, aerobic glycolysis is completely inhibited, and respiration is about 60 per cent. inhibited by 10^{-4} M iodoacetate (I). In normal Ringer solution respiration is not inhibited by (I). The inhibition by (I) is irreversible, and cannot be prevented by the addition of succinate or malonate (10^{-2} M).
ZELMA BAKER MILLER (Chem. Abstr.).

Isoelectric Point of Brain Cells in Hypnotic Poisoning. Aizawa, Tadasi. [Japan J. Med. Sci., **7**; Social Med. Hyg., **3**, Nos. 1, 2; Proc. Japan. Soc. Forensic Med., **23**, 19-20 (1939) (in German).]

The isoelectric points of Purkinjé cells of the brain of animals poisoned by dial, phenobarbital (I) and sulfonal (II) lies on the acid side, most distinctly for (I), least for (II).
ALFRED BURGER (Chem. Abstr.).

Effects of Direct Application of Histamine on Cerebral Cortex. Capri, A. [Arch. sci. biol. (Italy), **28**, 117-27 (1940).]

Local application of histamine on the cerebral cortex (sensory-motor area) of guinea-pigs produced motor reactions affecting muscles of the opposite side, and only slight general symptoms. This is similar to the effects obtained by application of antigen on the cerebral cortex of animals in a state of anaphylaxis (cf. Ciaccio and Capri, C. A., **31**, 1092⁷).
B. C. P. A. (Chem. Abstr.).

The Influence of Products of Metabolism of the Muscles on the Ability of the Neuromuscular Apparatus to Function. Polyakov, K. L. [Trudy Nauch.-Issledovatel. Inst. Fiziol., **3**, 369-86 (1938); Chem. Zentr., 1939 (11), 3310.]

In contrast to the action of perfusates of fatigued muscles, those of resting and working muscles increased the muscular contraction of isolated, fatigued muscle preparations. In this case the pH value was without influence on the contraction curves. The effect on the working musculature of the whole organism was not uniform.
M. G. MOORE (Chem. Abstr.).

*The Effect of Brain Metabolites on the Formation of Glycogen and Bile*in the Liver.* Gerchikova, K. A. [Trudy Nauch.-Issledovatel. Inst. Fiziol., **3**, 335-51 (1938); Chem. Zentr., 1939 (2), 3447; cf. C. A., **34**, 494³, 7381¹.]

Under normal conditions products of the blood and of the metabolism of the brain increase the content of the liver in glycogen and in bile pigment. After electrical stimulation of the brain during the period of excitation of the central nervous system the blood flowing from the brain produces an increase in the glycogen and the bile pigment contents of the liver which is in contrast to the effect during the state of depression.
M. G. MOORE (Chem. Abstr.).

Carbohydrate and Mineral Metabolism in the Brain in Various Conditions of the Vegetative Nervous System. Lokshina, E. S. [*Trudy Nauch.-Issledovatel. Inst. Fiziol.*, **3**, 128-48 (1938); *Chem. Zentr.*, 1939 (2), 3447.]

After a definite relation between the brain metabolism and the vegetative nervous system had been established, experiments were carried out in which dogs were injected with sympatheticotropic and parasympathotropic preparations (insulin, thyroïdin). This treatment produced an increase in the carbohydrate metabolism, retention of K, and increased excretion of Ca or an antagonistic effect. A relation between the effect of 24 hours without sleep and the effect of parasympathotropic substances on the metabolism could be demonstrated.

M. G. MOORE (Chem. Abstr.).

Comparative Studies on the Metabolism of the Brain of Infant and Adult Dogs. Himwich, Harold E., and Fazekas, Joseph F. [*Amer. J. Physiol.*, **132**, 454-9 (1941); *cf. C. A.*, **35**, 2203⁶, 2204⁴.]

With the aid of the Warburg apparatus determinations were made of the O consumption of various parts of the brain of puppies and adult dogs. The respiratory metabolism of the cerebral tissues was found to be characteristic according to the part of the brain and to the age of the animal. The O consumption of the newborn dog is lower than that of the adult. In the growing puppy the increase in metabolic rate proceeds rostrally from medulla to caudate nucleus. In the adult brain the respiratory metabolism of the various cerebral parts is higher in the newer phylogenetic layers. These differential rates of metabolism may yield a basis for the order of the symptoms of hypoglycemia and acute anoxia.

E. D. WALTER (Chem. Abstr.).

Iron-induced Oxidations in Brain and Other Tissues. Panimon, Frieda, Horwitt, M. K., and Gerard, R. W. [*J. Cellular Comp. Physiol.*, **17**, 1-16 (1941).]

The O consumption of brain and other pulped tissues, with or without added substrate (succinate, pyruvate, glucose, lactate), is increased by the addition of ferric or ferrous ion. The reaction is much influenced by pH and buffer anions. The extra O used serves to oxidize substances, probably protein precipitated by $\text{Cl}_2\text{CCO}_2\text{H}$; thermostable, and phospholipins, not serving as substrates in normal respiration but perhaps concerned in the respiratory mechanism. The catalyzed oxidations are not restricted to -SH groups. The action of the ferric ion is inhibited by ortho- and pyrophosphate and by cyanide but not by urethan. Catalysis is maximum in acetate buffer. Ferrous ion, although itself oxidized, catalyzes most effectively in phosphate buffer. Its action is not inhibited by the above-mentioned agents or by others which form stable complexes with it. Both Fe ions catalyze oxidations in liver and kidney pulp as in brain. Ferric ion is inactive toward spleen, and spleen (or hemoglobin) inhibits the ferric-induced oxidations of brain. Cu, Mn, Zn, Ni and Co do not increase O usage.

FELIX SAUNDERS (Chem. Abstr.).

o-Phenanthroline as Accelerator of Brain-tissue Oxygen Consumption. Panimon, Frieda, Horwitt, M. K., and Gerard, R. W. [*J. Cellular Comp. Physiol.*, **17**, 17-29 (1941); *cf. preceding abstract.*]

o-Phenanthroline and ferrous *o*-phenanthroline accelerate the O consumption of brain pulp in final dye concentrations as low as 2×10^{-6} M. The optimum concentration 2×10^{-4} M, triples O uptake over a 2-hour period and initially accelerates the rate 6-10 times. Added substrate (glucose) does not enhance the acceleration. Co, Ni and Cu complexes of *o*-phenanthroline produce no acceleration. The Zn complex produces a small one. O consumption of kidney, liver and muscle pulp is accelerated as much as is that of brain pulp; that of spleen pulp is not increased. Spleen, erythrocytes or hemoglobin depress the positive dye action on other tissues. α , α' -Bipyridyl and its ferrous salt also increase O uptake. Ferrous *o*-phenanthroline acts as such; the free dye possibly combines with tissue Fe before acting.

FELIX SAUNDERS (Chem. Abstr.).

Iron in the Brain. Gold, P., and Horwitt, M. K. [*Elgin Papers (Elgin State Hospital, Ill.)*, **4**, 241-4 (1941).]

The brains of patients with dementia praecox, general paresis, cerebral arteriosclerosis and without psychosis, contained 15.9-26.5 (av. 20) mgm. of Fe per 100 gm. of dried cortical substance. The variability from specimen to specimen as well as from area to area was so large that no diagnostic significance could be attached to the data. The "available" Fe (extracted by dipyriddy) content was also extremely variable.

H. L. MASON (Chem. Abstr.).

An Evaluation of the Physical and Mental Capabilities Following Removal of the Right Cerebral Hemisphere. Karnosh, I. J., and Gardner, W. J. [*Cleveland Clin. Quart.*, **8**, 94-106 (1941).]

Following removal of the right hemisphere, four patients showed the following characteristics: Hemiplegia of left side, lower extremities being less affected than upper; loss of symmetrical movement at left angle of mouth, but not elsewhere; no alteration in speech as motor performance; loss of 2-point sensation on left side except on face; perception of moving tactual stimulus as dull pressure and loss of ability to localize it; and absence of discomfort except for pain in

attempting to straighten spastic fingers. Disorientation and delusions were absent, and mental tests showed no abnormalities. However, personality became unstable, concentration became difficult, and patients were unable to adjust to life's responsibilities.

E. S. PRIMOFF (Psych. Abstr.).

The Mechanism of Cerebellar Disorders of Locomotion in Dogs. Schmelkin, D. G. [*Probl. mol. Nevrol. Psikhiat.*, No. 8, 41 ff. (1940).]

The locomotion in decerebellated dogs, after removal of all elements connected with disorders of equilibrium, was investigated. Epileptic seizures were induced by freezing restricted areas of the cortex. In 5 out of 8 dogs "stationary running" during the seizures was of a co-ordinated nature, while in the other 3 dogs it was irregular and characterized by dissociated movements in each extremity. The author concludes that the associated activity in the "stationary running" in decerebellated dogs is carried out with the same regularity of the rhythmic sequence as in normal dogs. This was also observed the day following extirpation of the cerebellum, that is when there was complete loss of function and no signs of compensation for the lost cerebellar activity. It is therefore suggested that in the disorders of normal locomotion in decerebellated dogs, the chief role is played by those agents which do not participate in "stationary running."

M. KELLER (Psychol. Abstr.).

Effect of Acoustic and Olfactory Stimuli upon Optic Chronaxy. Bogoslovsky, A. L. [*Bull. Biol. Med. exp. U.R.S.S.*, 8, 387-9 (1939).]

(1) Rheobase rises in darkness, falls in light; chronaxy remains at the same level. (2) With 18 minutes' acoustic stimulation both rheobase and chronaxy show a rise, which continues for the rheobase 25-30 minutes after cessation of the sound. Gradually both return to the initial values. (3) Bergamot oil raises both values; indol raises rheobase slightly, while lowering chronaxy. This difference is possibly due to the fact that the former acts on the sympathetic, the latter on the vegetative nervous system.

H. I. ANSBACHER (Psychol. Abstr.).

Effects of Inorganic Ions on the Respiration of Brain Cortex. Canzanelli, Attilio, Rogers, Gertrude and Rapport, David. [*Am. Journ. Physiol.*, 135, 309-15 (1942); cf. *C. A.*, 33, 8761³, 4].

The influence of inorganic ions on the O consumption of guinea-pig brain *in vitro* was studied. K stimulates respiration in concentrations as low as those present in mammalian serum. The optimum concentration appears to be about 0.04 M. K does not stimulate except in the presence of at least 0.02 M Na. Low concentration of Na is not in itself depressing to respiration. Hyper-tonicity of the medium tends to depress respiration. Li stimulates respiration in concentrations greater than 0.01 m. In a medium fully balanced as to inorganic ions, the respiration is the same as in a solution containing Na as the only cation. Ca and K appear to be the only cations that exercise a controlling influence on respiration.

E. D. WALTER (Chem. Abstr.).

The Prevention of Sensory Neuron Degeneration in the Pig, with Special Reference to the Role of Various Liver Fractions. Wintrobe, Maxwell M., Mushatt, Cecil, Miller, Joseph L., jun., Kolb, Lawrence C., Stein, Harold J., and Lisco, Hermann. [*J. Clin. Investigation*, 21, 71-84 (1942).]

Abnormal gait and degenerative changes in peripheral nerves, spinal ganglia and the posterior funiculi of the spinal cord developed in pigs deficient in factors other than thiamine, riboflavin and nicotinic acid but did not occur when desiccated whole liver or brewers' yeast was fed. Wheat germ together with alfalfa meal was not as effective in preventing sensory neuron degeneration as liver or yeast. As a result of testing the several fractions of liver obtained during the manufacture of the anti-pernicious anemia extract it was found that the fraction used in the treatment of pernicious anemia was most effective in preventing the degeneration, but large amounts were required.

J. B. BROWN (Chem. Abstr.).

Civilian Population Suffers Small Psychological Damage. Gillespie, R. D. [*N.Y. St. J. Med.*, 41, 2347-9 (1941).]

Fewer days were lost by English workers during the blitz than in normal times. Very few neuroses are attributable to war conditions. The problems of both children and adults are mainly the same as in peacetime, and to both satisfaction of everyday needs is more important than fear of death. Children are remarkably unaffected by air raids. Psychological trauma during a raid is manifested by panic, confusion, and ensuing amnesia, immobility, or physical symptoms of fear. Neurotics may become conspicuously courageous if given opportunities to overcome inferiority feelings. Disorganization rather than fright produces a breakdown after tragedy or terror, hence, to avoid a remote reaction prevent rumination. Functional somatic symptoms may appear after several weeks. Disorganization of routine is the most devastating factor for both evacuated and stay-at-home children.

M. E. MORSE (Psychol. Abstr.).

Mental Breakdowns in Army Avoided by Strict Tests. Gillespie, R. D. [*N.Y. St. J. Med.*, 41, 2346-7 (1941).]

This editorial draws on Gillespie's 1941 Salmon Lecture, in which he stresses the remarkable infrequency of neuroses in the R.A.F., due to rigid selection and a professional attitude toward

work. Neuroses are also almost unknown among army doctors. Shelter life helps to prevent neuroses through sharing danger and providing companionship. Apathy among exhausted soldiers and civilians whose lives are completely disorganized is the result of thwarting the instincts of self-preservation and activity. Psychiatrists should warn politicians of the threat to civilization through thwarting the activity instinct of a large part of the world, because following apathy will come rebellion and delinquency on an international scale.

M. E. MORSE (Psychol. Abstr.).

The Rorschach Test in Diagnosis of Psychoses and Psychoneuroses. Weil, A. A. [*J. Maine Med. Ass.*, **32**, 35-9 (1941).]

The author sketches briefly the nature of the Rorschach test, the scheme of scoring and interpretation. He discusses the "experience-type" as shown by Rorschach responses: extravert, introvert and ambiequal. "The neurosis of the introvert is neurasthenia and psychasthenia. The neurosis of the extravert is hysteria. The neurosis of the ambiequal is compulsion neurosis." In schizophrenics "the predominance of movement answers indicates introversive, paranoid cases. The predominance of color answers shows the motor excited catatonic types, and if all movement answers are absent, the hebephrenic type." Unique aids the test offers the psychologist, psychopathologist, and psychoanalyst are described. In cases of apparent cure of schizophrenia by shock treatment, the Rorschach psychogram still shows schizophrenic features. An example of an epileptoid diagnosis indicated correctly in a known schizophrenic illustrates the value of the test for treatment as well as diagnosis.

R. E. HOROWITZ (Psychol. Abstr.).

2. Pharmacology and Treatment.

Cooling Drugs and Cooling Centers. Rosenthal, F. E. [*J. Pharm.*, **71**, 305 (1941).]

In rabbits the injection of 1 γ picrotoxin or 0.01-0.07 γ aconitine into the infundibular region produces a fall of several degrees in temperature, accompanied by cardiac symptoms due to central vagal stimulation. The cooling effect of picrotoxin is suppressed by phenobarbital and by paraldehyde, but picrotoxin annuls simultaneously the fall in temperature produced by these drugs. In other kinds of experimental temperature fall (Ca narcosis, aconitine) picrotoxin shows an additive or even potentiated cooling effect. The experimental evidence favors the existence of temperature-lowering centers.

L. E. G. (Chem. Abstr.).

Variations of Glutathionemia during Insulin Shock in Dementia Praecox. Laignel-Lavastine, Bonnard, Y., Bouvet, M., and Asuad, J. [*Bull. acad. méd.*, **123**, 439-44 (1940).]

The metabolism of glutathione after insulin treatment in schizophrenics is discussed, with particular reference to tests for functional variations when the blood contains sulfhydryl compounds. In the tests free SH in blood was determined by means of (L), with starch indicator.

R. P. E. HOFF (Chem. Abstr.).

A Simple Method for Prolonging Therapeutic Insulin Coma. Wortis, Joseph, and Korr, Irvin M. [*Proc. Soc. Exptl. Biol. Med.*, **40**, 128-30 (1942).]

A heavy dose of insulin is administered, and then a 5 per cent. glucose solution is given by slow continuous intravenous injection at such a rate that the blood sugar is maintained between 35 and 40 mgm. per cent.

L. E. GILSON (Chem. Abstr.).

Mechanism of Insulin Convulsions; (1) Significance of Serum Electrolytes; (2) Effects of Breathing Atmospheres Varying Widely in Oxygen, Nitrogen and Carbon Dioxide Content. McQuarrie, Irvine, Ziegler, M. R., and Stone, W. E. [*Chinese Med., J.* **53**, 1-25 (1940); cf. *C. A.*, **34**, 1075⁹.]

Data from 93 experiments with dogs revealed no relationship between convulsive reactivity and the levels of the various serum constituents other than glucose. Insulin convulsions in the dog were, however, decreased by reducing the O₂ or by increasing the CO₂ content of the air. When no insulin was administered breathing a gas mixture of 88-95 per cent. N₂ and 12-15 per cent. O₂ caused reduction in K and inorganic P, but no other electrolyte changes. Air containing 10-15 per cent. CO₂ had no effect on the K, but caused a rise in inorganic P. Both types of atmosphere change caused hyperglucemia. No support for the anoxic theory of insulin convulsions is obtained.

WM. H. ADOPH (Chem. Abstr.).

Cerebral Blood Flow and Brain Metabolism During Insulin Hypoglycemia. Himwich, H. E., et al. [*Amer. J. Physiol.*, **132**, 640 (1941).]

The cerebral arterio-venous O difference and cerebral blood flow were determined on patients with schizophrenia during insulin hypoglycemia. The changes in blood-flow during hypoglycemia uncomplicated by convulsions usually show a slight diminution, averaging 7 per cent. A decrease in the arterio-venous O difference during insulin hypoglycemia is caused by an impaired cerebral metabolism which may be reduced to about a quarter of the original value. The injection of glucose during hypoglycemia has no marked effect on the brain blood flow, but the arterio-venous O difference increases. Lactate and pyruvate are not as effective as glucose in restoring brain metabolism.

E. D. WALTER (Chem. Abstr.).

The Effect of Insulin on the Metabolism of Carbohydrate Components in the Cerebral and Muscular Tissues. Komisarenko, V. P., and Marchuk, R. Ya. [*Problemy Endokrinol. (U.S.S.R.)*, **5**, No. 3, 28-35 (1940).]

Cerebral tissue of dogs absorbs greater amounts of sugar from blood than does muscle tissue. The decrease of sugar in arterial blood after administering 0.5 and 10 units of insulin per kgm. of weight during two hours does not decrease the amount of sugar absorbed from blood by these tissues. Only after 2.5 hours and especially at the height of insulin intoxication does the absorption of sugar by both brain and muscle decrease sharply as a result of the administration of 10 units of insulin per kgm. of weight. Cerebral tissue discharges less lactic acid into the blood stream than does muscle. After injection of 0.5 and 10 units of insulin per kgm. both the lactic acid content of arterial blood and the discharge of lactic acid by the muscular tissues increase. During the height of insulin intoxication the lactic acid content of blood decreases and reaches its initial value. The discharge of lactic acid by the cerebral tissue does not change during the initial 1.5 hours after administration of 0.5 unit of insulin. It increases slightly after administration of 10 units of insulin, and after 2 and 2.5 hours the cerebral tissue absorbs lactic acid from the blood. The decrease of blood sugar after administration of insulin is due, not to the decrease of the discharge by the liver, but to the increased absorption by the tissues, probably in connection with the increase of the permeability of the cell elements. The increase of the lactic acid in blood and its discharge by the muscles after administration of insulin is due to a compensatory discharge of adrenaline. Insulin has a smaller effect on the permeability of cerebral tissue than on that of muscular tissue. The sharp decrease of sugar consumption by both the cerebral and muscular tissues after 2.5 hours is due to the sharp decrease of the sugar content in arterial blood.
W. R. HENN (Chem. Abstr.).

The Metabolism of the Brain Before and After Insulin and Metrazole Shock Therapy as Measured by the Carbon Dioxide and Oxygen Content of the Blood. Horwitz, M. K., Liebert, E., and Wiltrakis, G. [*Elgin Papers (Elgin State Hospital, Ill.)*, **4**, 108-15 (1941).]

Determination of arterial-venous differences of CO₂ and O content gives inconsistent results and is not a suitable means for testing current theories regarding O utilization after modern shock treatments of schizophrenia.
H. L. MASON (Chem. Abstr.).

Experimental Convulsions. (1) Histo-pathological Changes in the Central Nervous System of the Monkey on Injection of Metrazole. Musaelyan, S. H. [*Arch. sci. biol. (U.S.S.R.)*, **59**, No. 3, 97-103 (1940).]

A 10 per cent. solution of metrazole in doses of 0.25-0.7 c.c. per kgm. body weight causes prolonged fatal convulsions. Death is due to subarachnoidal hemorrhages in the brain. The acute intoxication causes diffuse degenerative lesion in the central nervous system.
T. LAANES (Chem. Abstr.).

The Bases and Results of Insulin Shock and Metrazole Convulsion Treatment of Schizophrenia. Bingel, A. [*Sitzber. physik.-med. Soz. Erlangen*, **71**, 228 (1939).]

A Neuropathologic Study of Six Cases of Psychoses Treated with Metrazole. Weil, Arthur, and Liebert, Erich. [*Trans. Am. Neurol. Assoc.*, **66**, 162-4 (1940).]

In 6 psychotic patients treated with metrazole shocks and who died (of pulmonary or cardiovascular-renal disease) 2-10 months after the last injection, autopsy revealed brain changes similar to those previously observed in rabbits receiving metrazole injections. The changes consisted of marked hypertrophy and hyperplasia of astroglia and, to a lesser degree, of microglia.
MARION HORN (Chem. Abstr.).

Changes in the Brain after Metrazole and Camphor Convulsions in Animal Experiments. Rotter, Wolfgang, and Krug, Paul. [*Arch. Psychiat. Nervenkrankh.*, **111**, 380-96 (1940).]

WARREN M. SPERRY (Chem. Abstr.).

The Neurohistopathology in Monkeys Resulting from a Series of Metrazole Convulsions and Insulin Comas. Finley, Knox H., and Brenner, Charles. [*Trans. Am. Neurol. Assoc.*, **66**, 181 (1940).]

In monkeys subjected to a series of metrazole convulsions, the brains showed small foci in the cortex where the nerve cells had disappeared and a mild proliferation of the astrocytes was present. In monkeys subjected to insulin comas, the chief histological findings in the brain were various types of ganglion cell changes, pseudolaminar falling out of the nerve cells in various parts of the cortex, with a marked reaction on the part of the glial elements, particularly the astrocytes.
MARION HORN (Chem. Abstr.).

The Electrocardiographic Changes Observed During Artificially Produced Convulsions. Lieberman, Alan A., and Liebert, Erich. [*Illinois Med. J.*, **80**, 420-6 (1941).]

Tracheotomy was performed in rabbits under light ether anesthesia. After the effects of the ether had worn off the rabbits received intravenous injections of 10 c.c. 0.1 per cent. curare

followed by 0.3–0.7 c.c. 10 per cent. metrazole. In some experiments the metrazole was administered during deep ether anesthesia in rabbits. Severe disturbances of the action current of the heart are demonstrable after the intravenous administration of convulsant doses of metrazole in an experimentally curarized animal. These very profound disturbances of the electrocardiogram are brought about by a central stimulation and overstimulation. This effect can be completely abolished or markedly reduced by ether anesthesia. Although all the changes observed were rather transient in appearance, they were so severe and drastic that they led to alternans disturbances, fatal paroxysmal tachycardia and even auricular fibrillation. Thujone acted in a similar but less drastic manner than metrazole in producing electrocardiographic disturbances in the curarized rabbit.
RUTH BERGGREN (Chem. Abstr.).

Action of Aminoacetic Acid in Preventing Convulsions Produced by Metrazole. Pollock, Lewis J., Finkelman, Isidore, and Tigay, Eli L. [*Proc. Soc. Exptl. Biol. Med.*, **49**, 159–62 (1942).]

Aminoacetic acid (glycine) affords some protection against convulsions produced by intravenous injection, but its action in such cases is insignificant compared to that of pyridine, nicotinamide and phenylcinchoninic acid. Aminoacetic acid affords marked protection against convulsions produced by metrazole given subcutaneously.

L. E. GILSON (Chem. Abstr.).

Comparative Anticonvulsant Activities of 1-diethyl-acetyl-5, 5-cyclopentamethylene biuret, Sodium Diphenylhydantoinate and Sodium Pentobarbital in Mice. Anderson, H. H., and P'an, S. Y. [*Proc. Soc. Exptl. Biol. Med.*, **46**, 611 (1941).]

None of the above compounds saved the lives of mice given lethal doses of cocaine, although the biuret derivative (I) prevented convulsions in most cases. (I) prevented convulsions and death after lethal doses of picrotoxin and strychnine. Dilantin gave no protection against picrotoxin but saved 50 per cent. of the mice given strychnine. Na pentobarbital gave no protection against strychnine and saved 50 per cent. of the mice given picrotoxin.

L. E. GILSON (Chem. Abstr.).

The Action of Quinine Methochloride and Erythroidine in Human Subjects and a Method for Its Quantitative Determination. Harvey, A. M., Landis, E. E., Masland, R. L., and Wigton, R. S. [*Trans. Am. Neurol. Assoc.*, **66**, 154–7 (1940).]

After intravenous injection of 10–15 mgm./kgm. of quinine methochloride (I) or 16–18 mgm./kgm. of β -erythroidine (II) in man, the typical picture of partial curarization became evident. Ptosis of the eyelids appeared first, with weakness of the extrinsic ocular muscles. This was soon followed by weakness of the masticator muscles and tongue, accompanied by difficulty in talking. In patients showing spasticity or extrapyramidal rigidity, there was usually considerable reduction in the degree of tonic muscle contraction. The action potential of the abductor digiti quinti muscle in response to maximal stimulation of the ulnar nerve was considerably altered by the administration of (I) or (II). The response to a single nerve stimulus was 10–20 per cent. smaller than that recorded before administration of the drug, and this single response was followed by a depression reaching its maximum in about 400 msec. and lasting for over two minutes. When a second stimulus was given at this interval, the response was only half that of the first potential. When the nerve was stimulated repetitively at a rate of 10–15 per second, the successive spike heights showed an exponential decline to 40–50 per cent. of their original value, and then remained fairly constant. The electrical changes were in every way similar to those obtained by Brown (1938) in a study of the actions of curarine in the cat. The clinical symptoms, and the depression following a single response, usually disappeared within 20–30 minutes of injection of (I) or (II), but the inability of the muscle to maintain a tetanus persisted for a longer time. Unfavourable reactions to (I) and (II) have been few and transitory. Both drugs caused drowsiness, and (II) led in one patient to a period of disorientation and confusion similar to that sometimes produced by barbiturates. (I) Led to severe abdominal cramps, with nausea and vomiting, on two occasions. There was no change in pulse rate of blood pressure. It is suggested that (I) and (II) may prove useful as curarizing agents, and that the study of their effect on muscle action potentials may provide a method for quantitative study of the degree of curarization. Oral administration of (I) has been found effective in animals, and is being tried in man.
MARION HORN (Chem. Abstr.).

Central Effect of Curare. Euler, U. S. v., and Wahlund, H. [*Acta Physiol. Scand.*, **2**, 327–33 (1941).]

Intracisternal injection of pot. curare as well as of purified curarine chloride raises blood pressure and increases respiration in the cat. Prolonged action of large doses leads to paralysis of the respiratory and vasomotor centres. Continuous local or generalized convulsions are also produced by curare administered by intracisternal or intralumbal injection. Central stimulation of the vagus is caused by injection of curare into the internal carotid.

S. MORGULIS (Chem. Abstr.).

The Chemistry of Anticonvulsant Substances. Putnam, Tracy J., and Merritt, H. Houston. [*Trans. Am. Neurol. Assoc.*, **66**, 78–80 (1940).]

The hypothesis that convulsions are, at least in part, chemical phenomena is supported by

the facts that seizures can be excited in predisposed subjects (or areas of the brain) by hypoglycemia, oxygen deficiency, picrotoxin, metrazole or shift in blood pH, and that seizures can be inhibited (in some cases of *petit mal*) by excess of CO₂ or of glucose and insulin, and (in some cases of *grand mal*) by anticonvulsant drugs. A shift in the acidity of the milieu of the nerve cells may become a decisive factor in production of convulsions. Synthetic compounds which have been found by Putnam and Merritt to inhibit convulsions (*C. A.*, **34**, 8055⁶) are all liposoluble and have a slow solubility in water at neutrality; this suggests that they are capable of penetrating cell membranes. The great majority of them are composed of a terminal phenyl ring (rarely two) joined to a CO or SO or oxine group through one (rarely two) atom, usually of a carbon radical. A double bond is included in a ring (such as the malonyl or glycolyl urea nucleus), or it is linked to an alkyl or aromatic nucleus. The chemical formulas suggest that all these compounds are easily broken down, perhaps within cells, to form stable acids, usually aromatic. The hypothesis is tentatively advanced that such breakdown within cells is the mechanism of the anti-convulsant effect. (In the discussion, S. Bernard Wortis reported that sodium 5, 5-diphenylhydantoinate, one of the anti-convulsants studied by Putnam and Merritt, stimulated the consumption of oxygen by brain tissue *in vitro*, while phenobarbital, bromides, sodium amytal and morphine all diminished oxygen consumption.)

MARION HORN (Chem. Abstr.).

Effect of Electric Convulsive Therapy on Memory. Zubin, J., and Barrera, S. E. [*Proc. Soc. exp. Biol., N.Y.*, **48**, 596-7 (1941).]

Ten patients were taught paired word associates before treatment, and retention was tested after shock therapy by recall, relearning, and recognition methods. Control series were learned and tests of retention given a week before treatment. In the experimental series there is no significant saving, though learning ability is not impaired; recall and recognition scores also yield evidence of memory loss. Shock affects material learned immediately before shock more than that learned less recently.

H. PEAK (Psychol. Abstr.).

Effects of Morphine and Its Derivatives on Intermediary Metabolism. I. Influence of Morphine, Codeine, and Thebaine on the Activity of Several Dehydrogenases and on the Respiration of Rat Cerebrum. SeEVERS, M. H., and SHIDEMAN, F. E. [*J. Pharm.*, **71**, 373 (1941).]

The action of lactic, citric and glucose dehydrogenases from animal tissues was inhibited by 0.06-0.24 per cent. of morphine. Succinic and ethanol dehydrogenases were not affected. Codeine and thebaine in the same concentrations did not affect any of the above enzymes. Morphine, 0.12 per cent., had no effect on the O uptake of rat cerebrum without added substrate or with added citrate, succinate, fumarate and malate, but decreased the O uptake in the presence of added glucose, lactate, pyruvate and α -ketoglutarate.

II. Influence of Thiamine Deficiency on the Respiration of Skeletal Muscle and Cocarboxylase Content of Tissues of Normal and Chronically Morphinized Rats. [*Ibid.*, 383.]

The addition of morphine or pyruvate, or both together, causes a marked increase in the no-substrate O uptake of normal rat muscle. The addition of pyruvate to chronically morphinized rats' muscle causes a much smaller increase in O uptake. Thiamine-deficient muscle shows an even smaller O uptake in the presence of pyruvate. The increase in the O uptake of normal muscle resulting from the addition of cocarboxylase after addition of pyruvate was entirely lacking in both thiamine-deficient and chronically morphinized muscle. The cocarboxylase content of brain, liver and skeletal muscle was not significantly changed by chronic poisoning with morphine, codeine or phenobarbital.

L. E. GILSON (Chem. Abstr.).

The Barbiturates and the Liver. Richards, R. K., and Appel, M. [*Anesthesia and Analgesia*, **20**, 64 (1941).]

A study of the toxic effect of barbiturates on livers of dogs, mice, rabbits and monkeys indicated that some fatty infiltration occurred, but was of a transitory nature and could be prevented by feeding dextrose. It occurred most frequently when the barbiturates were administered. The action of long-acting barbiturates was not influenced appreciably by damaging the liver with CHCl₃, CCl₄ or by making fatty changes from feeding a choline-free diet. In a latter case the animals, however, appeared to sleep a bit longer. The action of short-acting barbiturates was considerably increased by liver impairment.

G. H. W. LUCAS (Chem. Abstr.).

Studies on Barbiturates. XXV. The Effect of Vitamin C Level on Barbiturate Depression in Guinea-pigs. Green, Melvin W., and Musulin, Rade R. [*J. Am. Pharm. Assoc.*, **30**, 613-16 (1941); cf. *C. A.*, **34**, 3822; **35**, 2217.]

There is a correlation between the vitamin C level and the response produced by phenobarbital or pentobarbital in guinea-pigs; the higher the vitamin level, the less the depression produced by the barbiturates. Frequent administration of these two barbiturates to guinea-pigs did not cause a depletion of vitamin C from the tissues. It is suggested that the most likely cause for the effect of vitamin C level on barbiturate depression is the altered general metabolism produced by the lack of this vitamin rather than an effect produced in major degree by direct conjugation.

A. PAPINEAU-COUTURE (Chem. Abstr.).

The Antagonism between Cycliton and Sodium Barbital. Algostino, Elsa. [*Arch. intern. pharmacodynamie*, **63**, 436-48 (1939); *Chem. Zentr.*, **1**, 2978 (1940).]

When injected intravenously into mice cycliton was somewhat more toxic than Na barbital. When the two substances were used together in ratios of 3 : 1, 2 : 2 and 1 : 3 the mortality of the animals showed that at low concentrations the cycliton was antagonistic in effect to Na barbital, while at high concentrations the effects of the two preparations were additive.

M. G. MOORE (Chem. Abstr.).

Colorimetric Determination of Some Barbiturates in Urine and Blood. Belenits'ka, D. S. [*Ukrain. Gosudarst. Inst. Ekspl. Farm. (Kharkov), Konsul'tatsionnye Materialy*, No. 3, 72-4 (1939).]

The determination is based on the color reaction of barbiturates with Co salts in alkaline solution in anhydrous alcohol. To 10 ml. of blood or urine add 10 ml. of CHCl_3 , shake the mixture in a separatory funnel for 5 minutes and let stand until the layers separate. Remove the CHCl_3 layer to another separatory funnel, add 1 ml. of diluted HCl and 2 ml. distilled water, and shake for 2-3 minutes. Filter the colorless CHCl_3 layer and evaporate the filtrate on a water bath to 2 ml. To the residue add from a micropipet 0.2 ml. of 1 per cent. $\text{Co}(\text{NO}_3)_2$ and 0.2 ml. of 5 per cent. piperidine solution (a violet color is obtained, the intensity depending on the amount of the substance under investigation). A similar solution with a known content of the preparation is used as a standard. To determine Na evipan, which produces a turbid solution under these conditions, extract with CHCl_3 from an acid solution. The sensitivity of the reaction with respect to evipan is considerably less than that with respect to barbital.

W. R. HENN (Chem. Abstr.).

Morphine and Barbiturates in the Brain. Favarger, P. [*Arch. intern. pharmacodynamie*, **64**, 427-31 (1940).]

Examination of the brain in cases of morphine poisoning showed only traces of the drug, more in the central nuclei than in the hemispheres. After death from barbiturate poisoning, the central nuclei contained much more of the drug than the hemispheres.

M. L. C. BERNHEIM (Chem. Abstr.).

Treatment of Acute Barbital Poisoning. Bouckaert, J. J., and Marri, R. [*Arch. intern. pharmacodynamie*, **64**, 461-75 (1940).]

The mortality of guinea-pigs injected with 0.4 gm. Na diethylbarbiturate was 70 per cent., but when the drug was given with veritol the deaths were only 35 per cent. Benzedrine, picrotoxin and cardioton were also effective. Other drugs had no effect and strychnine increased the mortality.

M. L. C. BERNHEIM (Chem. Abstr.).

The Role of Picrotoxin in the Treatment of Acute Barbiturate Poisoning. Richards, R. K., and Menaker, J. G. [*Anesthesiology*, **3**, 37-48 (1942).]

Picrotoxin is useful in the treatment of barbiturate poisoning. No evidence of organic damage has been found, even after the administration of very large doses of picrotoxin, provided it has been done with the necessary care. The difficulty of a statistical evaluation of the results is outlined, and a clinical study of the technique and the limits of picrotoxin therapy are presented.

RUTH BERGGREN (Chem. Abstr.).

The Arousal Effects of Picrotoxin and Coramine in Avertin Narcosis. Maloney, A. H. [*Arch. intern. pharmacodynamie*, **64**, 432-44 (1940).]

Death can result from avertin poisoning either immediately or after several days. The delayed deaths are caused by secondary visceral lesions. Picrotoxin hastens arousal from the anesthetic, but coramine delays it.

M. L. C. BERNHEIM (Chem. Abstr.).

The Effect of Alcohol on Mental Activity. Wechsler, David. [*Quart. J. Studies Alc.*, **2**, 479-85 (1941).]

A comparison was made of the scores on Wechsler-Bellevue intelligence tests of 16 chronic alcoholics, aged 36-42, of 13 chronic alcoholics aged 45-55, of 100 normal control subjects aged 35-39 and of 60 normal control subjects aged 45-49. None of the alcoholic subjects was psychotic. The results indicated that older alcoholic persons are significantly inferior to younger alcoholic persons in certain types of mental activity, notably those involving logical analysis and organization. This deterioration with age was far less marked in the non-alcoholic controls.

MARION HORN (Chem. Abstr.).

Analysis of the Subjective Responses of Psychoneurotic Patients to the Intramuscular Administration of Adrenaline, Mecholyl (Acetyl- β -methylcholine) and Saline. Lindemann, Erich, and Finesinger, Jacob E. [*Trans. Am. Neurol. Assoc.*, **66**, 147-50 (1940).]

Forty psychoneurotic patients showed variability in somatic sensations and emotional states after intramuscular injection of 1 c.c. of 1 : 1000 adrenaline (I) and 25 mgm. mecholyl (II). The most striking sensations reported after (I) were heart-pounding (70 per cent. of the cases), trembling (55 per cent.), nervousness (38 per cent.), shaking of the legs (70 per cent.). After (II)

the symptoms most frequently reported were sense of general heat (58 per cent.), feeling of discomfort (57 per cent.), difficult breathing (45 per cent.), fullness and warmth in the head (35 per cent.), perspiration (30 per cent.) and dizziness (28 per cent.). Patients became more communicative after (II), less communicative after (III). A euphoric effect was noted in 24 patients receiving (II), and a depressant effect in only 2 receiving (III). After (I), on the other hand, 30 per cent. of the patients felt depressed, worried or angered, and none felt happy. Control saline injections produced depression in one patient, vague weakness in 18 per cent., relaxation in 15 per cent., sleepiness in 13 per cent.

MARION HORN (Chem. Abstr.).

Nature of Myasthenia Gravis. The Intra-arterial Injection of Acetylcholine, Prostigmine and Adrenaline. Harvey, A. M., and Lilienthal, J. L., jun. [Bull. Johns Hopkins Hosp., 69, 566-77 (1941).]

In a series of 8 patients with myasthenia gravis, the effects of prostigmine (I), acetylcholine (II) and adrenaline (III) were studied after intra-arterial injection (0.5-3.0 mgm., 20-40 mgm. and 0.4-0.6 mgm., respectively). (I) produced local and then general return of motor power. It failed to evoke the local muscle fasciculations and the motor weakness, characteristic of injection into normal patients. (II) caused local pain, flushing and sweating, and a powerful sustained contraction of the injected muscles. The latter effect was in sharp contrast to the transitory weakness evoked in normal subjects. (III) produced a moderate return of local motor power in a myasthenic patient with weakness of the hands. The authors suggest that the fundamental defect in myasthenia gravis may be a reduction in the normal quantity of proper transmitting agent released, or available for release, by the terminal branches of the motor nerves at the neuromuscular junction. The reduction in the quantity of transmitter released may be masked to a variable degree by an increased sensitivity of the muscle end-plate to the transmitting agent. Because of the similarity between myasthenia gravis and partial curarization, it is suggested that a circulatory inhibitory substance may cause the primary neuromuscular defect; this substance may arise from the thymus.

Z. B. MILLER (Chem. Abstr.).

The Effects of Intra-arterial Injection of Acetylcholine and Prostigmine in Normal Man. Harvey, A. M., Lilienthal, J. L., jun., and Talbot, S. A. [Bull. Johns Hopkins Hosp., 69, 529-46 (1941).]

The effects of acetylcholine (I) and prostigmine (II) upon motor power and neuromuscular transmission in the hand of normal man were studied by injection of the drugs into the brachial artery. In amounts varying from 10 to 50 mgm. (I) produced profound stimulation of the cholinergic nerves, severe pain and a sensation of forceful flexion in the motionless extremity, and transient paresis of motor power. In amounts varying from 0.1 to 1.5 mgm. (II) produced a more prolonged paresis of the injected extremity, and many visible fasciculations in the muscles of the injected arm. The neuro-muscular block produced by (II) was analysed by means of electromyographic studies of the muscle action potentials evoked by supramaximal stimulation of the ulnar nerve. This block, which appears only after activity of the neuro-muscular junction, is dissipated spontaneously and rapidly in most individuals within 100 msec. The neuro-muscular block created by (II) is similar in some respects to that observed after partial curarization. It is suggested that prostigmine produces weakness by protecting acetylcholine from hydrolysis until a paralysing concentration is attained.

ZELMA BAKER MILLER (Chem. Abstr.).

Convulsant Action of Acetylcholine. Moussatché, H., and Dias, M. Vianna. [Rev. brasil. Biol. (Rio de Janeiro), 1, 457-62 (1941) (in French).]

Acetylcholine solutions applied directly to the motor areas of the cerebral cortex of the dog produce epileptiform convulsions. This action is potentiated by morphine given intraperitoneally.

L. E. GILSON (Chem. Abstr.).

The Action of Several Perfect and Imperfect Sympathomimetic Drugs on the Vascular Effects of Acetylcholine and Histamine. Bariéty, Maurice, and Kohler, Denyse. [Compt. rend. soc. biol., 135, 161-4 (1941).]

Adrenaline, 1-(m-hydroxyphenyl)-2-(methylamino)-1-ethanol, 1-(p-hydroxyphenyl)-2-(methylamino)-1-ethanol, 1-ephedrine, norephedrine, 3-(methylamino-2-phenyl-2-butanol, β -aminopropiophenone and γ -dimethylamino-butyrophenone have a different action on the vasodilatation of acetylcholine from that which they have on the vasodilatation of histamine. They diminish the former and augment the latter.

FELIX SAUNDERS (Chem. Abstr.).

The Action of Acetylcholine, Eserine and Other Substances on Some Motor Responses of the Central Nervous System. McKail, R. A., Obrador, S., and Wilson, W. C. [J. Physiol., 99, 312-28 (1941).]

E. D. WALTER (Chem. Abstr.).

Influence of Glycine on the Intermediary Metabolism of Beri-beri Patients and Its Therapeutic Success. Huse, N., Ozi, K., Kodono, Y., Maeda, S., Nagao, H., Hatai, R., Kikuti, J., Miyosi, Y., and Yamamoto, T. [*Japan. J. Med. Sci. VIII Internal Med., Pediat. Psychiat.*, **5**, No. 2; *Proc. Japan. Soc. Internal Med.*, **34**, 168-9 (1939) (in German).]

In some very serious beri-beri cases, even large doses of a highly active vitamin B₁ preparation were ineffective, but a combined B₁-glycine (20 gm. per day) therapy led to definite improvement.

ALFRED BURGER (Chem. Abstr.).

Studies of the Detoxication of Local Anesthetics. (II) Measurements of the Anticonvulsive Action of Calcium Salts. Wastl, H. [*Arch. intern. pharmacodynamie*, **64**, 381-426 (1940).]

The study of Ca salts which diminish the toxic effect of large doses of local anesthetics was continued (cf. *C. A.*, **34**; 5179⁶). With procaine-HCl and butyn-SO₄ a simple proportionality holds between the dose of Ca salt and the effect. Ca benzoate, levulinat, salicylate and lactate are relatively less effective when injected separately than when mixed with the drug, but the reverse is true of Ca gluconate. Butyn-SO₄ is more effectively detoxified than procaine-HCl. The molecular weight of the anion is not a factor nor is the pH. The effectiveness when injected with the drug decreases in the following order: Ca benzoate, salicylate, levulinat, lactate and gluconate. With separate injections the order is: Benzoate, gluconate, salicylate, levulinat, and lactate. In almost 7,000 experiments Ca salts delayed and shortened the duration of the toxic effects following large doses of local anesthetics and the death rate is decreased. Ca levulinat is suggested for clinical use.

M. L. C. BERNHEIM (Chem. Abstr.).

The Influence of Arsenobenzene Preparations on the Retention of Relapsing Fever Spirochetes Introduced into the Cerebrospinal Fluid of Rabbits. Hozyo, Tuguyosi. [*Folia Pharmacol. Japon.*, **30**, 158-68 (Breviaria; 15-16) (1940); cf. *C. A.*, **34**, 8054^{5, 6}.]

The blood of normal rabbits infected with relapsing fever spirochetes retained its power to infect mice for 20-120 hours after the injection. In rabbits suffering from meningitis induced by injecting 5 per cent. lycopodium in Ringer solution in the cerebrospinal fluid, the fluid retained its power to infect mice for 16-120 hours. If neoarsphenamine was given 24 hours after the injection was made the blood lost its power to infect mice, but the spinal fluid still retained some power to do so. Injecting neoarsphenamine before injecting the rabbits still left the cerebrospinal fluid with about the same infecting power it had in the previous case, but the blood did not lose all its power to infect mice, for in a few cases infection of mice was secured.

G. H. W. LUCAS (Chem. Abstr.).

The Action of Organic Arsenical Preparations on Spirochetal Infections of the Central Nervous System. III. The Passage of Arsenic into the Cerebrospinal Fluid after Intravenous Injection of 3-Amino-4-hydroxybenzenearsonic Acid under Various Conditions. Hozyo, Tuguyosi. [*Folia Pharmacol. Japon.*, **30**, 152-7 (Breviaria, 14-15) (1940); cf. *C. A.*, **34**, 8054^{5, 6}.]

Twelve hours after injection of this drug in normal rabbits only a trace of As could be found in the brain. In the presence of fever or recurring spirochete infection, larger quantities were found in the brain and cerebrospinal fluid, and blood concentrations remained higher after intravenous injections of the drug.

G. H. W. LUCAS (Chem. Abstr.).

The Central Action of Some Nerve Poisons on Intestinal Movements. Hukuhara, Hisahumi. [*Folia Pharmacol. Japon.*, **30**, 169-80 (Breviaria, 16-17) (1940); cf. *C. A.*, **34**, 2068.]

After ligation of the superior mesenteric artery, injected atropine produces a central stimulation of intestinal movements in the rabbit. This action was prevented by section of the vagi. Phenobarbital and large doses of chloral inhibited this effect. Atropine introduced into the fourth ventricle likewise produced an intestinal stimulation. It was shown also that sympathol and adrenaline have a central effect, decreasing intestinal movement.

G. H. W. LUCAS (Chem. Abstr.).

Toxicity of Hypnotics as Affected by Temperature, Thyroxine and Adrenalectomy. Richards, R. K. [*Anesthesiol.*, **2**, 37 (1941).]

Dose-mortality curves were constructed and the temperature toxicity coefficients calculated for pentothal-Na (I), pentobarbital-Na (II) and paraldehyde (III) in frogs and for I in mice. In frogs the toxicity of I and II but not of III is higher at 10° than at 20°. Possible reasons for these unusual observations are discussed. Stimulation of the metabolism by thyroxine markedly increases the susceptibility of frogs to II. The increase in toxicity of I for mice after the temperature is raised from 22° to 30°-35° is relatively small. However, if metabolic regulation is disturbed by adrenalectomy, an increased susceptibility is observed which becomes particularly marked at higher temperatures. The absolute toxicity of I in frogs is about twice as great as in mice.

R. BERGGREN (Chem. Abstr.).

Action of Hypnotics on the Thalamic Centers. (I) Magnesium Sulfate and Gastric Secretion. La Barre, Jean, and Kellenmeyer, Georges. [*Arch. intern. pharmacodynamie*, **66**, 305-14 (1941).]

Intravenous injection of $MgSO_4$ (150 mgm./kgm.) suppresses gastric hypermotility and the secretion of gastric juice normally produced by the injection of insulin, but does not affect the hypersecretion caused by histamine. This is probably caused by the action of the drug on the hypothalamus.

(II) Sodium Barbitol and Magnesium Sulfate and Adrenaline Secretion. [*Ibid.*, 315-24.]

Intravenous injection of Na barbitol or $MgSO_4$ (150 mgm./kgm.) completely inhibits the adrenaline secretion resulting from the injection of insulin. This is not caused by a peripheral curare-like action, but is the result of paralysis of the thalamic centers.

M. L. C. B. (Chem. Abstr.).

The So-called "All or Nothing Law of Narcosis." Winterstein, Hans, and Derman, Halil. [*Arch. intern. pharmaco-dynamie*, **66**, 293-304 (1941).]

The decrease of excitability of frog nerve treated with urethan or chloral hydrate is proportional to the concentrations of the drugs. Therefore, the "all or nothing law of narcosis" does not hold.

M. L. C. BERNHEIM (Chem. Abstr.).

Effect of Sulfonamides in Suppurative Meningitis. (I) Permeability of the Cerebral Meninges to Sulfonamides. Taki, Koo. [*Oriental J. Diseases Infants*, **28**, 17-19 (1940).]

Aseptic meningitis was produced in healthy rabbits of about 2 kgm. body weight by injecting 0.5 c.c. normal horse serum into the fourth ventricle by occipital puncture on the day before the experiment. The cerebrospinal fluid (I) was obtained by occipital puncture; the aqueous humor (II) was taken from the limbus of the cornea. The Japanese sulfonamides, Aktisol and Yuron, and the sulfanilamides, Gerisen, Lusic, Therapol, Ponsil and Aktiweiss, were used. In the oral administration an emulsion of the required amount in 5 per cent. mucilage was given by stomach tube. In healthy rabbits Aktisol, even if injected in large amounts in saline solution, does not penetrate into (I). Sulfanilamide passes into (I) in the largest amounts after intramuscular injection; some sulfanilamide is present in (I) one hour after injection; a maximum is noted after 3 hours; after 5 hours the amount present corresponds to that found after 1 hour; it still continues to pass into (I) after 24 hours. Less sulfanilamide appears in (I) after oral administration; the time relations are analogous to those after intramuscular injection. The least sulfanilamide appears in (I) after intravenous injection; the amount is nearly the same after 1, 3 and 5 hours. The amount of Yuron which passes into (I) is smaller than that of sulfanilamide; about the same amounts of Yuron pass into (I) after 1, 3, and 5 hours. More sulfanilamide appears in (I) of rabbits with meningitis than in (I) of healthy rabbits; the curve of penetration is analogous to that of healthy rabbits. Sulfanilamide passes readily into (II). The largest amount appears after intramuscular injection. The difference in the amounts which have entered (II) after 1 and 3 hours is not as great as with (I). The passage of sulfanilamide into (I) and (II) shows individual differences. Comparatively less Yuron than sulfanilamide passes into (II). The time of penetration of sulfanilamide and Yuron into (II) is nearly the same in healthy rabbits and those with meningitis.

(II) Effect of Sulfanilamide in Meningitis Complicated by Hemolytic Streptococci. [*Ibid.*, 20-1.]

(III) The Value of Sulfonamides in Pneumococcal Meningitis. [*Ibid.*, 22-3.]

RUTH BERGGREN (Chem. Abstr.).

The Pharmacologic Influence of Galvanic Skin Reflexes. Essen, K. W., and Rogge, Kurt. [*Arch. expl. Path. Pharmacol.*, **194**, 527-38 (1940).]

The effects of galvanic stimulation and various drug substances in man and experimental animals were studied. Phenobarbital, prominal, strychnine and synephrine were studied. Skin reflex time was retarded by phenobarbital and prominal even with the accelerated skin reflexes of Basedow's disease and thyroid toxicoses. In frogs the locus of action of strychnine was central and synephrine acted peripherally.

C. J. CARR (Chem. Abstr.).

Mental Symptoms Following Carbon Disulfide Absorption and Intoxication. Braceland, Francis J. [*Ann. Internal Med.*, **16**, 246-61 (1942).]

Acute CS_2 intoxication is comparable to the narcotic effects of other gaseous anesthetics. Chronic CS_2 absorption is associated with liver damage and subsequent vitamin B deficiency. There is no doubt of the existence of toxic psychosis due to CS_2 , characterized by confusion, combativeness, hallucinations, delusions and amnesia during the acute attack. CS_2 probably is an inciting agent in individuals predisposed to mental illness. Workers in CS_2 should have a vitamin-rich diet.

J. T. MYERS (Chem. Abstr.).

Chemical Prophylaxis of Experimental Poliomyelitis. Schultz, E. W., and Gebhardt, L. P. [*J. Infectious Diseases*, **70**, 7-50 (1942).]

There are a number of chemical agents which, in aqueous solution of sufficient concentration and efficiently applied to the olfactory mucosa in monkeys, induce a well-defined resistance

against later intranasal instillation of poliomyelitis virus. They differ greatly in their power to induce this resistance. Certain ones, like a 1 per cent. solution of $ZnSO_4$, require a single application, while others require repeated treatments to provoke a marked and fairly lasting resistance. Those preparations that are more protective are those that are more damaging to the olfactory mucosa. The resistance provoked may not become effective before 2 or 3 days after application of the agents, nor is it active 3 to 6 months after treatment. Reasons are given for doubting the practical value of chemical prophylaxis for controlling the natural diseases in man.

J. H. LEWIS (Chem. Abstr.).

The Changes Produced on the Oxygen and Carbon Dioxide Content of Arterial and Venous Blood of the Brain During Diathermy Therapy for General Paresis. Looney, Joseph M., and Borkovic, Embrie J. [*Am. J. Physiol.*, **136**, 177-81 (1942).]

E. D. WALTER (Chem. Abstr.).

Morphological Changes in the Nerve Cells of the Sympathetic Trunk of Frog Caused by Injection of Arsenious and Arsenic Acids. Skoblenok, S. [*Bull. biol. méd. exptl. U.R.S.S.*, **8**, No. 6, 489-92 (1939) (in French).]

Sublethal doses of H_3AsO_3 produce great changes in the structure of the nerve cells. These changes take place much more rapidly from H_3AsO_3 than from H_3AsO_4 .

W. R. HENN (Chem. Abstr.).

Effects of Vitamin B₆ in Paralysis Agitans. Joliffe, N. [*Tr. Am. Neurol. Assoc.*, **66**, 55 (1940).]

Trial of vitamin B₆ in paralysis agitans was made because muscular rigidity and weakness are characteristic of the disease and vitamin B₆ is involved in muscle metabolism. Intravenous administration of 50-100 mgm. daily or every other day to 15 cases resulted in objective and subjective improvement in 4, and subjective improvement alone in 2. The patients showing improvement were ones who had been disabled for less than 3 years and who gave no history of encephalitis. Control injections of saline produced no improvement. Vitamin B₆ can be given intramuscularly.

M. HORN (Chem. Abstr.).

The Response of the Cerebral Cortex to Local Application of Strychnine Nitrate. Dusser de Barenne, J. G., et al. [*Am. J. Physiol.*, **132**, 776 (1941).]

The application of strychnine to the cerebral cortex produces no significant changes in the pH or in the concentrations of inorganic phosphate, phosphocreatine, adenylyl pyrophosphate or hexose phosphates.

E. D. WALTER (Chem. Abstr.).

Ether Anesthesia and Cerebral Anoxia. A Study of the Causative Factors in the Serious Anesthetic and Post-anesthetic Complications. Courville, C. B. [*Anesthesiol.*, **2**, 44 (1941).]

The anesthetic action of Et_2O may be described as a progressive and selective narcosis of the various levels of nervous function. The ultimate effect may be due, in part at least, to partial interference with tissue respiration. Even in deep anesthesia, the cortical motor elements are still sensitive to stimuli, which accounts for the occurrence of "Et₂O tremors" or the more malignant "Et₂O convulsions." Sudden death under Et₂O anesthesia is apparently due to excessive depression of the respiratory center or to depression of the cardiac muscle. The essential danger in respiratory failure is that Et₂O not only depresses the center, but also renders it less sensitive to the action of CO₂ and to impulses coming to the center from the respiratory passages. Most of the varied "causes" of "Et₂O convulsions" seem to bear some relation to a disturbed tissue respiration. This suggests that anoxemia, in one form or another, is the exciting cause of such convulsions. Other complications of Et₂O anesthesia are also discussed. While much less common than after N₂O anesthesia, the identical grouping of the cases of Et₂O complications and the close resemblance of the consequent manifestations to those after N₂O seem to warrant the conclusion that such symptoms are likewise due to anoxemia.

R. BERGGREN (Chem. Abstr.).

Conditioned Reflex Therapy of Alcoholic Addiction. III. An Evaluation of Present Results in the Light of Previous Experiences with this Method. Voeglin, W. L., Lemere, W., and Brox, W. R. [*Quart. J. Stud. Alc.*, **1**, 501 (1940).]

A cure expectancy of over 64 per cent. may be anticipated from the treatment of alcoholism by injecting emetine hypodermically to promote nausea when alcohol is seen, smelled or tasted, in order to produce a conditioned reflex of aversion to alcohol. Apomorphine is unsuitable as the nauseating stimulus because its emetic and nauseating effect is too brief, because it exerts a hypnotic or euphoric after-effect, and because it sometimes produces sudden collapse in alcoholics.

M. HORN (Chem. Abstr.).

The Treatment of Delirium Tremens and Acute Alcoholic Hallucinosi. Silverman, I. J. [*Med. Ann. Dist. Columbia*, **9**, 291 (1940).]

The mortality rate of acute alcoholism is substantial. Intravenous injection of 100 c.c. of 5 per cent. NaCl, followed by 150 c.c. twice daily, saved a large number of the uncomplicated cases. The incidence of lobar pneumonia is decreased. Spinal puncture is unnecessary.

J. C. MUNCH (Chem. Abstr.).

Dietetic and Related Studies in Multiple Sclerosis. Brickner, Richard M., and Brill, Norman Q., with the assistance of Frances H. Naylor and Kathryn Montgomery. [Trans. Am. Neurol. Assoc., **66**, 157-62 (1940).]

An investigation of the life-long dietary habits of 34 patients with multiple sclerosis revealed that the patients were poor eaters in general, and had a particularly poor intake of dairy fats. Nine attacks occurred in 7 patients following changes in food intake. In 2 cases the attack came during a drastic reduction in food intake, but more commonly it occurred during a period when the caloric intake was increased (possibly resulting in a low vitamin to B₁ calorie ratio); three of the attacks of 2 patients were known to have occurred during periods of excessive increase in intake of carbohydrates which were low in vitamin content. Except for 6 advanced cases, all patients did well on a corrected dietary regime. MARION HORN (Chem. Abstr.).

Further Progress in the Treatment of Amyotrophic Lateral Sclerosis with the Tocopherols (Synthetic Vitamin E). Wechsler, Israel S. [Trans. Am. Neurol. Assoc., **66**, 59-60 (1940); cf. C. A., **35**, 1843¹.]

Since the last report, 24 patients with amyotrophic lateral sclerosis have been treated with vitamin E. Of these, 8 to 10 have shown varying degrees of restitution or recovery, some to the point where they may be said to be well. Despite the fact that the majority showed bulbar involvement and a few were in terminal stages, none of the patients died, which indicates that vitamin E arrested the progress of the disease. Report will be made of studies of gastric, pancreatic and bile function in relation to oral and parenteral vitamin E therapy, and of creatinine studies as an index to the effect of vitamin E administration. It is pointed out that the concept of "degenerative disease" has become meaningless, and that the discovery of the specific vitamin deficiency in amyotrophic lateral sclerosis opens up the field of other "degenerative diseases" to investigation. The wheat-germ oil was tried by Denker on the theory, not substantiated, that there might be a therapeutic agent in the vitamin E complex which was not present in *α*-tocopherol itself. MARION HORN (Chem. Abstr.).

Trypanocidal Activity and Arsenic Content of Human Blood after Administration of Tryparsamide. Hawking, F. [Trans. Roy. Soc. Trop. Med. Hyg., **34**, 305 (1940).]

Persons were given an intravenous injection of tryparsamide and measurements were made of the power of the plasma to kill trypanosomes of a serum-resistant strain of *T. gambiense*. Immediately after injection trypanocidal activity was absent. It rose to a maximum in 24 hours and then gradually decreased to an inappreciable amount at 96 hours. Trypanocidal activity produced by tryparsamide in blood was somewhat greater than that previously observed in cerebrospinal fluid, but its time relations were approximately similar. E. O. WHITTIER (Chem. Abstr.).

Trypanocidal Activity and Arsenic Content of the Cerebrospinal Fluid of Sleeping-Sickness Patients after the Administration of Tryparsamide. Hawking, F. [Trans. Roy. Soc. Trop. Med. Hyg., **34**, 269 (1940).]

The degree of trypanocidal activity produced by tryparsamide in the cerebrospinal fluid of a series of patients was insufficient to exert much effect on freshly isolated strains of *T. rhodesiense*. Only insignificant degrees of trypanocidal activity were produced in the cerebrospinal fluid by neocryl or by undecane diamine. E. O. WHITTIER (Chem. Abstr.).

Further Observations on the Treatment of Sleeping Sickness with Neocryl. Acres, I. S. [Trans. Roy. Soc. Trop. Med. Hyg., **34**, 281 (1940).]

It is confirmed clinically that the trypanocidal activity of cerebro-spinal fluid is less when neocryl is administered than when tryparsamide is used. E. O. WHITTIER (Chem. Abstr.).

Anticonvulsive Action of Disodium 2-(4-sulfamidophenyl-azo)-7-acetylamino-1-hydroxynaphthalene-3,6-disulfonate (Neoprontosil) in Epileptic Patients. Cohen, Mandel E., and Cobb, Stanley. [Trans. Am. Neurol. Assoc., **66**, 199-202 (1940).]

Oral administration of neoprontosil led to decrease in incidence of convulsions in 6 out of 9 epileptic patients. The anticonvulsive effect of the drug was associated with its tendency to lower the blood pH. There were no toxic symptoms other than slight anemia. MARION HORN (Chem. Abstr.).

Changes in Brain Volume During Anesthesia: The Effects of Anoxemia and Hypercapnia. White, J. C., Verlot, M., Selverstone, B., and Beecher, H. K. [Arch. Surg., **44**, 1-21 (1942).]

Neither swelling of tissue nor congestion of the cerebral vascular tree takes place in cats anesthetized with pentobarbital-sodium provided there is an adequate airway. In cats anesthetized with ether there is a slight dilation of the cerebral vessels, but probably not sufficient to be significant in man. Anoxemia results in an increase in inter- or intracellular fluid, or both. Rise in CO₂ tension caused engorgement of the cerebral vascular tree. JOHN T. MYERS (Chem. Abstr.).

Effect of Amphetamine (Benzedrine) on Fatigue of the Central Nervous System. Simonson, Ernst, Enzer, Norbert, and Blankstein, S. S. [*War Medicine*, **1**, 690-5 (1941).]

Fatigue of the central nervous system consistently decreases the frequency at which flicker fusion occurs. Benzedrine sulfate given 3-5 hours before the end of the working day increases the flicker-fusion frequency, the increase paralleling the abolition of the sense of fatigue.

FELIX SAUNDERS (Chem. Abstr.).

Neuropathologic Changes in Experimental Carbon Disulfide Poisoning in Cats. Ferraro, Armando, Jervis, Geo. A., and Flicker, David A. [*Arch. Path.*, **32**, 723-38 (1941).]

In cats exposed to CS₂, proliferation of the capillaries and hypertrophy of the blood-vessel walls were found, also extensive neurocellular changes involving both cortical and subcortical structures. The lesions were most severe in the cerebellar nuclei, where bilateral softening was generally found, and in the vestibular nuclei. In one animal softening was also found in the lenticular nucleus and the substantia nigra.

M. L. C. BERNHEIM (Chem. Abstr.).

Evipan and the Parasympathetic Nervous System. Emmelin, Nils. [*Acta Physiol. Scand.*, **2**, 289-310 (1941).]

Evipan diminishes the effects caused by stimulating the parasympathetic nerves. It exerts this action even if the nerve has been cut above the electrode. Its action must, therefore, be peripheral. Furthermore, this effect can also be demonstrated in isolated organs. The effect of evipan, however, is cholinergic rather than parasympathetic, since it is also manifested by sympathetic fibers of cholinergic nature, while the adrenergic fibers of the cardiac vagus are not affected by evipan. Evipan also counteracts the muscarine-like effects of acetylcholine. Evipan acts as a mydriatic in the eye. It depresses the sensitivity of the iris sphincter to acetylcholine. It does not, however, influence the chorda tympani secretion of saliva.

S. MORGULIS (Chem. Abstr.).