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Investigations into the Reflexes during the Post-convulsive Stage of Metrazol and Electro-shock Seizures.

The purpose of the present investigations was to study the reflexes during the post-paroxysmal state in metrazol and electro-shock seizures. The material was supplemented by a few cases of "spontaneous" epileptic fits. In some of the cases an electromyographic registration of the events during the seizure and the post-paroxysmal state was made.

Generally, three phases of the post-paroxysmal state could be discerned. During the first phase there was a total extero-ceptive areflexia with a persistence of the most simple reactions only, the breathing movements and the two-neuron-reflexes. The last reflexes (the muscle reflexes) were—as stated by Kino and Kalinowsky *et al.*—exaggerated in most cases during the first phase. In most cases, however, this exaggeration did not appear immediately after the cessation of the convulsions, but after a lapse of about 2 seconds. It is discussed whether this exaggeration was due to a subliminal after-activity in the spinal tracts. In a few cases of metrazol-shock seizures there appeared a continuous activity during the intervals between the convulsions as well as immediately after the cessation of the convulsions. This phenomenon pointed to a persistent action of the drug and to differences in the effect on different regions of the central nervous system. This early form of continuous activity was associated with exaggerated muscle reflexes as opposed to the later spontaneous activity during the second phase of the post-paroxysmal stage. In this phase the subject starts to react to nociceptive stimuli and the first exteroceptive reflexes are seen (first the corneal reflex, then the pupillary light reflex, then the pupillary reflex and later the Babinski reflex), while the exaggeration of the muscle reflexes wanes until the reflexes are of normal briskness. Thus, the

* A number of abstracts in this section are reproduced from *Chemical Abstracts* and *Psychological Abstracts*. To the Editors of these two Journals we extend our grateful thanks.

positive Babinski reflex (demonstrable in about 75 per cent. of the cases) and the exaggeration of the muscle reflexes are dissociated phenomena. During the third phase—from about 5 to about 10 minutes after the cessation of the convulsion—the normal skin reflexes reappear, and the subject, still in a state of confusion, begins to react to verbal stimuli. (Author's abstr.)

The Histopathological Reaction of the Area Postrema.

In general the pathological reactions in the areae postremae are similar to those in the leptomeninges and are quite unlike those which occur in other parts of the nervous system. This is partly to be accounted for by the proximity of these areae to the meninges and the apparent communication along rather wide Virchow-Robin spaces with the subarachnoid space. Other important factors may be the looseness of the tissue, permeability of the blood vessels, and peculiarities in tissue structure. The present study supports the idea that this distinctive anatomical region of the nervous system, whose biological significance is as yet unknown, maintains its unique character in ageing processes and in its reactions to a variety of different diseases. (Authors' abstr.)

The Action of Hydrogen Peroxide on the Undamaged Brain Surface.

The effect of solutions of hydrogen peroxide of varying concentration on the cat's brain was investigated. A 10 per cent. solution caused an intense vasodilatation of the pia, probably extending into the depth of the cortex, with markedly increased permeability to trypan-blue. The nerve cells of the superficial cortical layers showed signs of acute injury. A 5 per cent. solution had the same effect, though in a less degree. A 3 per cent. solution caused only changes which in all probability are passing. It is recommended to use hydrogen peroxide solutions not stronger than 3 per cent. for hemostatic purposes in neurosurgery. (Authors' abstr.)

Mental Symptoms in Association with Pituitary-Hypothalamus Lesions.

A rather uniform emotional syndrome seems to have been ascertained on the basis of a number of case histories, partly for patients with pituitary lesions (Group I), and partly for patients with a well-characterized lesion, no doubt of hypothalamic origin (Group II). This syndrome is characterized particularly by emotional instability and egocentricity, symptoms which often cause these patients to be called "hysterical." Although these are frequent mental symptoms which cannot be said to constitute a characteristic mental picture, they are by no means reminiscent of the preoccupation with themselves and their disease so common among neurotics and patients with diseases running a protracted course. The present series of patients had clinically well-characterized brain lesions and the mental symptoms are supposed to have been due in both groups to affection of the vegetative (hormonal?) centres in the hypothalamus. A third group of patients, who undoubtedly likewise had or had had an organic brain lesion, presented, after the occurrence of the organic lesion, typically "hysterical" symptoms, suggesting a lesion in the hypothalamus also in these patients.

The material thus bears out the theory of the great importance of the hypothalamus for emotional disturbances and hysterical reactions. Accordingly it will be expedient in such cases also to look for signs of disturbance in the more "somatic" functions of the hypothalamus, among others, fat and carbohydrate metabolism, sexual function and blood pressure. (Author's abstr.)

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Comparative Lymphocytic and Biochemical Responses of Patients with Schizophrenia and Affective Disorders to Electroshock, Insulin Shock and Epinephrine.

The effect of epinephrine on the circulating white blood cells in normal and psychotic (schizophrenic and manic-depressive) subjects are shown to be similar and approximate the effects obtained on psychotic subjects after electroshock treatment. Insulin also produced a lymphocytopenia but changes occurred more slowly and were of longer duration.

Investigation of plasma proteins and hemoglobin showed no significant differences in changes following epinephrine injection. After electroshock there was an immediate increase in serum proteins and hemoglobin with a return to pre-shock amounts in $\frac{1}{2}$ to 1 hour. The lymphocytopenia occurred later and could not therefore be accounted for by hemodilution.

It is concluded that the circulating lymphocytes in psychotic subjects respond to epinephrine in the same way as do the controls. Furthermore, electroshock and insulin coma produce a lymphocyte response similar to that following epinephrine. These data do not support the contention that there is a disorder of pituitary-adrenal function in psychotic patients. On the other hand, apparently stressful psychologic disturbances in psychotic patients are not accompanied by lymphocytopenia or hyperglycemia. In this respect they differ from normal subjects. It is suggested, therefore, that there is a defect in psychotic patients which obstructs communication between the central nervous system and the endocrine system. (Authors' abstr.)

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The Effect of Glutamic Acid Upon the Mental and Physical Growth of Mongols.

1. Glutamic acid accelerates both mental and physical growth in Mongols.
2. Improvement in mental growth, while genuine, is not as great as in non-mongoloid retardation.
3. Improvement in physical growth, however, is striking over a 6 months' treatment period. (Authors' Abstr.)

The Carotid Sinus in Neuropsychiatric Cases.

The electroencephalographic, electrocardiographic and clinical effects of carotid sinus stimulation, unilaterally and bilaterally, were studied in 122 individuals.

In every case in whom satisfactory carotid sinus compression was performed, cardiac slowing or asystole was obtained immediately. One-fourth of the cases showed asystoles, usually 3-5 seconds in duration but varying up to 9 seconds.

In 66 per cent. of the cases high voltage 3 per second slow waves appeared abruptly in the EEG diffusely and symmetrically, after 10 seconds of sustained forceful compression of the carotid sinuses.

In 60 per cent. of the cases unconsciousness with a short tonic-clonic seizure occurred immediately after the appearance of the slow-wave discharge. The seizure lasted 5-15 seconds, with recovery immediate and complete.

These effects of compression could be repeated many times with remarkable consistency without any cumulative or permanent effects upon the EEG or EKG.

Compression of the common carotid arteries below the bifurcation produced immediate acceleration of the heart. The central effects were obtained after approximately 10 seconds of sustained compression and were similar to those obtained by carotid sinus compression.

Elevation of blood pressure reduces the central effect of carotid sinus compression. Electric shock and prefrontal lobotomy facilitate the central effect of carotid sinus compression.

The central effects of carotid sinus compression described above are thought to be due largely to interference with the carotid circulation to the brain. (Authors' Abstr.)

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Transorbital Lobotomy.

Transorbital lobotomy accomplishes much the same effect as topectomy of Areas 9 and 10, in that it abates the psychosis without producing any undesirable personality changes.

Transorbital lobotomy is simple, quick and safe. It is recommended particularly for psychiatrists in mental hospitals where major neurosurgical procedures are not available.

Transorbital lobotomy under electroconvulsive shock should be undertaken when active therapy fails or is about to be replaced by "maintenance therapy." It should be definitely understood, however, that the procedure is a minor one and that some cases may later require major lobotomy for permanent relief.

(Authors' Abst.)

Frontal Lobotomy.

Since May, 1946, 107 patients have undergone frontal lobotomy at the Fairfield State Hospital. The group was composed almost entirely of individuals suffering from chronic mental illness whose prognosis seemed extremely unfavorable; 85 per cent. were schizophrenics. The average duration of mental illness was 7.4 years and of hospitalization, 4.4 years prior to operation. The results following lobotomy have been encouraging: 56.7 per cent. of the entire group exhibited significant improvement; thus far, 37.4 per cent. have been able to leave the hospital. The mortality rate was low, and complications, except for convulsive seizures, have been relatively infrequent. Prognostic guides seem to consist chiefly of the type of illness and the character of symptomatology. Results were best in the non-schizophrenic group, next best in the paranoid catatonic, and mixed types of schizophrenia, and poorest in simple and hebephrenic dementia praecox. Disturbed, aggressive, combative and hostile patients appeared to receive maximum benefit. Duration of illness had relatively little significance as a prognostic guide. Lobotomy may be especially helpful in patients suffering from pulmonary tuberculosis, which is a specific contraindication to shock therapy. There is no reduction of intellectual functioning following operation; patients who could be tested exhibited an average rise of 10 points on the Wechsler-Bellevue scale 6 months postoperatively. Lobotomy appears to be a fruitful method in the treatment of chronic mental disease.

(Authors' abstr.)

The Effects of Prefrontal Lobotomy on the Symptomatology of Schizophrenic Patients.

The clinical results of prefrontal lobotomy were studied in 100 cases of schizophrenia. Ten patients were much improved, 32 were improved, 42 were slightly improved, 14 were unimproved and 2 were worse. While the figures were more favourable in cases of less than 5 years' duration, worth-while improvement was obtained with considerable frequency in patients who had been ill for periods up to, and even beyond, 20 years.

In order to determine what the foregoing results mean in terms of individual mental functions, various symptoms were studied before and after lobotomy.

According to these observations, lobotomy leads to amelioration of some of the secondary or less important symptoms; it renders the patients more susceptible to external stimuli, so that they are less able to isolate themselves from the environment; and it reduces certain active reactions to more passive ones, thereby making the patients more tractable. However, prefrontal lobotomy apparently fails to produce any noteworthy improvement of the psychopathologic disturbances which are most important in schizophrenic disorders.

In view of these observations the opinion is expressed that the selection of schizophrenic cases for treatment by lobotomy should be confined largely to patients who have been ill for 4 or 5 years or longer. (Authors' abstr.)

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Activation of Seizures and Electroencephalographic Disturbances in Epileptic and in Control Subjects with "Metrazol."

Electroencephalographic and clinical responses to "metrazol" were studied in 132 epileptic patients and in 42 non-epileptic, control subjects in the attempt to develop a method for the activation of epileptic discharge for diagnostic purposes. Three modes of administration of "metrazol" were studied in separate groups of patients: rapid intravenous injection, intramuscular injection and slow intravenous injection of a 2 per cent. solution at the rate of 20 mg. each half-minute. Monkeys with experimentally produced focal epileptogenic lesions were also studied.

The method of rapid intravenous injection of small doses of the 10 per cent. solution was discarded because of the abrupt onset of its convulsant action, making observations on the form of onset of the epileptic pattern difficult, and because of the difficulty in regulating the optimum dose required. Some generalized "metrazol seizures" were obtained in epileptic patients whose habitual attacks were of focal onset.

Intramuscular injection of a 10 per cent. solution was more satisfactory as a method for the activation of the patient's habitual pattern of electroencephalographic disturbance and form of clinical seizure, but the injections were painful and the dosage was difficult to assess and to control.

The slow intravenous injection of the dilute solution was not painful, produced a gradual activation of epileptiform disturbance in the electroencephalogram and often induced the aura or onset of the patient's habitual clinical seizure, at which time the injection could be stopped (and phenobarbital administered) before a severe generalized attack occurred. Major seizures did occur, however, in a few patients. The principal results may be summarized as follows.

1. Epileptiform discharge was increased or induced in the electroencephalogram of 80 per cent. of the epileptic patients studied with the slow intravenous method. A clinical response revealing the nature of the onset of the patient's spontaneous attacks occurred in 56 per cent. of these patients.

2. An epileptiform seizure occurred in only 1 (3 per cent.) of the non-epileptic (control) subjects given the maximum dose of 400 mg. of "metrazol" in the same manner. Paroxysmal 4 to 6 per second, bilaterally synchronous slow wave disturbances occurred in the electroencephalograms of 26 per cent of the control subjects. There was some evidence that this response indicated a low convulsive threshold, but the effect was considered non-specific with regard to the diagnosis of clinical epilepsy.

3. Susceptibility to "metrazol" seemed related to the patient's convulsive threshold, since it was decreased in patients with infrequent seizures and in those receiving anticonvulsant medication at the time of the examination. Patients over 40 years of age seemed less susceptible.

4. Patients with idiopathic epilepsy, especially with a bilaterally synchronous wave and spike electroencephalographic pattern, were most sensitive to "metrazol." Patients with bilaterally synchronous electroencephalographic disturbances were more sensitive than those with superficial focal epileptogenic lesions of the cortex.

5. "Metrazol" slowly administered in small doses served to activate experimentally produced focal epileptogenic lesions of the cortex in monkeys and to induce seizures of focal motor onset.

6. The slow intravenous injection of dilute solutions of "metrazol" has definite advantages over other methods now available for the induction of seizures in epileptic patients. When used in conjunction with the electroencephalograph, it makes possible a clear diagnosis in many cases in which the nature of the seizures has previously been obscure. (Authors' abstr.)

Role of Afferent Impulses in Experimental Convulsions.

The influence of afferent impulses on convulsive movements and on cortical and hypothalamic potentials was studied. The afferent impulses were induced by mechanical or electrical stimulation of the sciatic nerve or by electrical stimulation of the sciatic nerve or by electrical stimulation of the posterior portion of the hypothalamus. Observations were made at various degrees of picrotoxin poisoning. The following results were obtained on cats anesthetized with "dial."

With adequate degrees of picrotoxinization, stimulation of either the sciatic nerve or the hypothalamus induced convulsions for various periods during and after stimulation. Ligation of the sciatic nerve seemed to be the most effective procedure. If slight convulsions existed prior to the stimulation, afferent stimuli might greatly aggravate these convulsions.

If convulsions were precipitated or intensified as the result of afferent stimuli, the cortical potentials increased in amplitude and frequency. In a number of observations large, frequent spike potentials, resembling those seen in cases of status epilepticus, occurred.

The study of cortical and hypothalamic potentials under the influence of hypothalamic and sciatic stimulation in picrotoxinized animals revealed that hypothalamic and cortical "convulsive" activity may be dissociated. It is concluded that, although afferent impulses originating in the hypothalamus may initiate or intensify convulsions, the hypothalamus does not seem to determine the rate of cortical "convulsive" activity in these experiments.

It appears that the motor area is not particularly sensitive to picrotoxin, since sensory and suppressor areas may show larger and more frequent spikes. Consequently, severe "convulsive" discharges may be precipitated in non-motor areas of the cortex as a result of afferent stimuli in the absence of overt convulsive movements.

The study of cortical potentials in cats subjected to intravenous injections of picrotoxin or to local strychninization shows that an increase, as well as a decrease, in "convulsive" activity may result from afferent stimuli. Other conditions being equal, the former effect is due to strong, and the latter to weak, stimuli. Intensification of "convulsive" potentials seems to be associated with increased recruitment and decreased synchronization, whereas suppression of convulsive potentials is accompanied with decreased synchronization only. On cessation of stimulation, increased "convulsive" discharges (rebound) may follow suppression of "convulsive" potentials during stimulation.

Quantitative differences in the convulsive reactivity of different cortical areas account for the fact that an afferent stimulus may increase "convulsive" potentials in one area and decrease them in another. (Authors' abstr.)

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Manic-Depressive Psychosis: Course when Treated and Untreated with Electric Shock.

Two groups of patients with a diagnosis of manic-depressive psychosis are compared: a control group of 80, and a group of 74 treated with electric shock. These groups were comparable with respect to age of onset of the depression for which the patient was admitted; duration of illness before admission; percentage of typical depressions, number of depressions per patient; duration of pre-admission depressions; age (decade) of onset for all the depressions the patients had had; distribution of single and multiple depressions, and racial, cultural and economic factors. The control group was followed up to fourteen years after discharge, the median period being seven years, and the shock group was followed up to four years, with a median period of three years.

In the control group, at the end of the follow-up period for the admission depression, 63 patients, or 79 per cent, had recovered spontaneously; 6, or 7 per cent., had committed suicide; 4, or 5 per cent., had died of causes other than suicide, and 7, or 9 per cent., were still depressed. Five of the 6 suicides occurred within 14 months after the patient's discharge. In 2 of the 4 deaths the mental illness was an important contributing cause. The patients who were still depressed had been transferred to state psychiatric hospitals, where they continued to reside, from 76 to 117 months later.

In the shock group, at the end of the follow-up period for the admission depression, 65 patients, or 88 per cent., showed complete recovery; 1, or 1 per cent., had committed suicide; 1, or 1 per cent., had died of causes other than suicide, and 7, or 10 per cent., were still depressed. The suicide occurred 42 months after discharge, and the cause of the death was unrelated to the mental illness. The patients who were still depressed had been discharged 24 to 48 months previously and had lived continuously outside institutions for patients with mental disease.

The median duration of depression for the 63 patients in the control group who recovered spontaneously was 15 months, and that for the 65 patients of the shock group who showed complete recovery was 9 months. Hence, shock therapy shortened the duration of the depression by 6 months. This saving would have been increased if the treatment had been given earlier, since the median duration of depression prior to admission was 4 months.

Evidence was introduced to show that shock therapy does not prevent subsequent depressions, nor does it predispose to subsequent depressions.

An analysis was made of factors frequently mentioned as related to the course of depressions. This analysis included family history, premorbid personality, age of onset, acuteness of onset, type of onset, severity of symptoms, typicality of psychosis, duration of illness before treatment, number of previous depressions, number of shocks and sex of patient. In the control group, there was a definite increase in duration of the depression with advancing age of onset and with severity of symptoms. The length of a depression could not be predicted in any given case from knowledge of the length of previous depressions. There was a suggestion that depressions with psychogenic onset lasted longer than depressions with endogenous onset, and that atypical depressions were longer than typical depressions. Family history, prepsychotic personality, acuteness of onset, number of previous depressions and sex of the patient had no relation to the outcome or duration of the admission depression. No factor was isolated which was associated with depressions of long duration. In the shock group, none of the aforementioned factors had a significant relation to the results of shock, though there was some evidence that atypical depressions responded better than typical ones, and first depressions better than second or third depressions. No factor was found to be associated with depressions which failed to respond to shock or with subsequent depressions. The factors associated with the response to shock are therefore unknown.

It is concluded that electric shock therapy is indicated in the treatment of manic-depressive psychosis (depressive type, mixed type, perplexed type and type with paranoid features). The basis of this conclusion is that shock therapy produces a rate of recovery as high as that of spontaneous recovery, reduces the incidence of suicide, probably prevents deaths and shortens the duration of depressions. It should be emphasized that the length of a depression cannot be predicted in a given case and that some depressions, particularly in older patients, may be very long—the longest in the authors' series being 10 years.

(Authors' abstr.)

Ergotamine Tartrate in Treatment of Combat Exhaustion.

In a controlled series of matched patients, ergotamine tartrate appeared to be more effective in relieving the symptoms of combat exhaustion than good ward management and group psychotherapy alone.

The subjective sense of tension and the tremor were the symptoms most strikingly relieved by ergotamine tartrate.

Pain in the legs, particularly a sense of tightness of the adductors of the thigh, was a common, but not serious, complication of treatment with ergotamine tartrate.

In contrast with the observations of another investigator, no evidence of circulatory disturbance of the extremities was noted.

One patient had an attack of syncope, with a pulse rate of 38 a minute, but in this case there was a history of previous syncopal attacks. It is concluded that "sodium amytal" is required in much smaller doses in narcosis therapy when combined with ergotamine tartrate. Excitements are less of a problem in patients treated with the two drugs in combination than in patients treated with "sodium amytal" alone.

It is suggested that ergotamine tartrate may exert a central influence on the reflexes concerned in the control of tremor and tonus in the voluntary musculature. (Authors' abstr.)

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Relation of "Thinking" and Language: An Experimental Approach, Using Dysphasic Patients.

A method is described whereby the language-thought problem may be attacked experimentally. The degree of receptive disorder was approximated in 18 dysphasic patients by a test administered in a standardized manner. Each patient was then matched with a "normal" hospitalized patient in respect to age, sex, colour, formal schooling, social and economic status, original language and intelligence quotient. It was further possible in the case of 5 of the dysphasic patients to match them with non-dysphasic patients having a lesion in the "subordinate" hemisphere. The ability of the dysphasic and the non-dysphasic patients to discover solutions to "non-verbal" problems of graded difficulty was then measured by the use of a multiple choice apparatus. The prime object in each problem posed was to learn as quickly as possible how to extinguish a light by selecting a crucial key bearing specific positional and colour relations to neighbouring keys.

The ready accessibility of language cues in nondysphasic persons might be expected, in terms of behaviouristic, *Gestalt* and certain other theories, to afford their thinking processes an appreciable advantage over those of dysphasic persons. However, for the particular tests used here, no significant differences were demonstrable between the scores made by the experimental and the control groups. Generalizations based on the data thus far obtained do not appear warrantable.

The method described is susceptible of indefinite elaboration as regards the difficulty of the problems posed. (Author's abstr.)

Cerebral Vascular Lesions: Electroencephalographic and Neuropathologic Correlations.

1. Subarachnoid hemorrhage primarily induces minimal or moderate generalized abnormal electroencephalographic changes. Occasionally focal decreased electric output is also observed.

2. Subdural hemorrhage, in the main, acts as an intracranial space-consuming lesion.

3. Relatively superficial lesions (thromboses or hemorrhages) give rise to prominent focal slow wave activity.

4. Deep subcortical lesions give rise to little focal or general low frequency activity.

5. Patients with arterial hypertension show progressive electroencephalographic changes with continuing chronicity. (Author's abstr.)

SEPTEMBER.

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Changes in Brain Structure and Memory After Intermittent Exposure to Simulated Altitude of 30,000 feet.

Young adult male guinea-pigs were subjected to conditions simulating an altitude of 30,000 feet in a decompression chamber six hours daily and six days weekly for 100, 150, 200 or 250 hours. At appropriate times, the experimental animals and controls were killed by perfusion through the vascular system of a solution of formaldehyde to fix and preserve the nervous system and other organs in situ. Histologic technique was carefully controlled.

The animals responded to reduced barometric pressure by maintaining a quiescent state, usually with episodes of physical distress, collapse and, apparently, unconsciousness. After their removal from the chamber, comparison with controls rarely revealed significant behavioural or physical differences. No permanent neurologic defects could be observed. Some loss of weight occurred.

Twenty-four of the animals were trained to solve an alternation maze to the point of perfection. Four controls were picked at random from the superior half of a group of initial learners and 5 from the inferior half of this group. The rest of the animals were exposed to conditions of simulated altitude.

All animals were retested after 100 hours at low pressure. No difference in retentive capacity between the control and the experimental group was noted at that time. After 150, 200 and 250 hours of decompression, groups consisting of 4 experimental animals showing the greatest signs of distress in the chamber at the time and 2 or more controls selected at random were retested and then killed for study of pathologic changes in the brain. In all these retests, the controls exhibited perfect retention of memory, while all the experimental animals gave evidence of retentive loss. The most significant impairment of memory occurred in the samplings from the 150 and 250-hour groups; a closer correlation with pathologic alterations in the brain could be made in these groups than in the sampling from the 200-hour group. However, all experimental animals in the 200-hour group required retraining on the retest, whereas their controls did not.

Focal areas of degeneration occurred in the vermis of the cerebellum of all animals of the 200 and 250-hour groups and in 3 of the 7 animals studied in the 100 and 150-hour groups. Elsewhere in the brain, small areas of cell shrinkage or (less commonly) impaired staining occurred, fortuitously it seemed. For the most part, the tissues of the brain appeared normal, and most regions looked exactly like comparable regions in the control brains. The focal areas of degeneration or other structural change may have resulted from vascular stasis; leukostasis was encountered in the 250-hour group.

The present experiments demonstrated that anoxia prevailing under the conditions of an altitude of 30,000 feet did not in itself cause demonstrable structural

changes in the brain, but that it indirectly brought about focal defects. The impairment of memory occurred without specific correlation with pathologic changes in the brain. (Authors' abstr.)

Dynamic Anatomy of the Cerebral Circulation.

By means of dye injection technique in living human subjects, the partition and distribution of the circulation of the head were studied.

Evidence is presented that blood entering the brain via each internal carotid artery is distributed almost wholly to the ipsilateral hemisphere and drained predominantly by the internal jugular vein on the corresponding side.

Evidence is presented that blood in each internal jugular vein is fairly representative of the drainage from all the histologic components of the brain.

The data indicate that blood in the internal jugular vein at the level of the superior bulb is relatively free of blood derived from extracerebral sources. On the other hand, blood in the external jugular vein contains a significant fraction of cerebral venous blood.

In 7 patients, the total cerebral blood flow was estimated by a dye dilution technique from samples obtained simultaneously from the internal jugular bulbs.

The relation of these findings to various suggested methods for measuring human cerebral blood flow is discussed. (Authors' abstr.)

Studies on Headache: Analysis of Vascular Mechanisms in Headache by Use of the Human Centrifuge, with Observations on Pain Perception Under Increased Positive G.

Exposure to a positive acceleration of 3.0 or 4.0 g. (centrifugal forces in the head to seat direction) on the human centrifuge had little or no effect on the pain threshold to the stimulus of radiant heat or on the intensity of pain induced by a variety of stimuli.

Experimentally induced headaches of non-vascular origin arising from compression or irritation of the surface tissues of the head were only slightly reduced in intensity during exposure to a positive acceleration of 3.0 g.; the minor changes in such headaches were attributable to distraction.

Experimentally-induced headaches of moderate severity arising from distention of cranial arteries (histamine and caffeine-withdrawal headaches) were eliminated during exposure to positive accelerations of 2.0 or 3.0 g., a relief attributable to a concurrent fall in intravascular pressure at the head level.

Clinical headaches of vascular origin responded similarly, for in subjects experiencing headache related to hunger, recent head trauma or emotional tension, all with clinical features suggesting that the pain arose from distention of intracranial or extracranial arteries, the headache was completely eliminated during exposure to a positive acceleration of 2.0 g.

A brief headache was sometimes noted in the normal subject during release from increased positive g.; such headache probably arises from transient distention of cranial arteries, and in this respect is the analogue of headache induced by negative g.

The human centrifuge is a useful tool in the analysis of vascular mechanisms in headache. (Authors' abstr.)

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Psychomotor Epilepsy.

Three hundred patients with epilepsy whose electroencephalogram showed a psychomotor type of discharge were studied; 90 per cent. had a history of clinical psychomotor seizures. In all cases a spike focus could be demonstrated in the anterior temporal area on one or both sides. This focus was most readily demonstrable during natural or induced sleep.

Psychomotor epilepsy is a specific epileptic syndrome characterized by clinical psychomotor seizures and by an epileptic type of involvement of the anterior portion of the temporal lobe, as evidenced by a focus of spike seizure activity in that area; it is usually associated with personality disorder.

The incidence of epilepsy in near relatives of patients with a psychomotor type of focus is almost ten times as high as in the general population and at least as great as the familial incidence of "idiopathic" epilepsy. This suggests that the tendency to a focus in the anterior temporal area can be inherited.

Patients with psychomotor epilepsy are rarely benefited by treatment with any or all of the anti-epileptic substances at present available. The focus is located in an accessible "silent area." In severe cases surgical removal of the discharging region should be attempted. (Authors' abstr.)

Changes in the Brain Associated with Electronarcosis: Report of a Case.

The pathologic changes in the brain of a patient who died three hours after the first treatment with electronarcosis are reported.

1. There were distinct, recent hemorrhages in the caudate nuclei, the medial nucleus of the thalamus, the posterior hypothalamic nuclei, the supraoptic nucleus, the cerebellum and the choroid plexus of the lateral ventricles.

2. There were fresh, smaller hemorrhages in the cerebral cortex, the corpus callosum, the optic tract and the pineal gland.

These changes must be considered related to the treatment, in view of the time relation, the nature of the lesions and the absence of any other probable causative agent. (Authors' abstr.)

The Electroencephalogram of Multiple Sclerosis: Review of the Literature and Analysis of Thirty-Four Cases.

The electroencephalogram was abnormal in 62 per cent. of 34 cases of multiple sclerosis in exacerbation.

In this series an abnormal electroencephalogram was more consistently associated with multiple sclerosis in exacerbation than was a first zone colloidal gold curve.

This series revealed no electroencephalographic signs specifically diagnostic of multiple sclerosis.

In obscure cases with no objective evidence of cortical or subcortical involvement, the electroencephalogram may be used to differentiate multiple sclerosis from pure spinal cord disease. (Authors' abstr.)

Canine Epilepsy Caused by Flour Bleached with Nitrogen Trichloride ("Agene") : III. Electroencephalographic Analysis.

The electroencephalographic abnormalities developing progressively in dogs when they ingest an otherwise nutritionally adequate diet containing 75 per cent. white wheat flour bleached with "agene" (nitrogen trichloride) are shown to resemble the electroencephalographic patterns associated with human idiopathic epilepsy. (Authors' abstr.)

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Phenurone in Epilepsy.

Phenacetylurea (phenurone) has been shown to possess superior anticonvulsant properties against both electro-shock and metrazol convulsions in animals and is a drug of low toxicity.

This drug is an important addition to the therapeutic agents that are used for the treatment of epilepsy, for it will in some cases control seizures that are not controlled by any other medication. In the present series it was found useful against all types of seizure and was uniquely effective against psychomotor seizures. Phenurone may be used alone or in combination with Mesantoin or phenobarbital. The chief limiting side effect is the intensification of pre-existing personality disorders. It should be used with caution in such cases. Since Phenurone can

increase the non-ictal psychiatric symptomatology while reducing the ictal or purely epileptic component, it reveals an antithesis between these two components.
(Authors' abstr.)

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Electrical signs of Epileptic Discharge.

1. The only form of electrical activity which is thought to characterize a local epileptogenic lesion of the cortex is the random spike discharge.
2. The local spike discharge must become repetitive at a fairly rapid frequency before sufficient activation occurs to cause a change in behaviour or awareness of the patient.
3. The spread of epileptic activation is manifest by an enhancement of the background spontaneous rhythms before the form of its activity is changed to a multiple spike pattern indicating violent local autonomous activation of this distant cortical area. Specific regions may produce a depression in background activity at the onset of an attack.
4. Large areas of the cortex may be activated by electrical signs of epileptic activity, with little obvious change in the patient, these areas being the anterior frontal region and large portions of the temporal and parietal lobes. Spread to subcortical structures seems likely when changes in level of consciousness and behaviour automatisms are associated with epileptic discharge.
5. The cerebral cortex alone, isolated from connections to subcortical structures, is capable of maintaining epileptic after-discharge, so that long reverberating circuits are not required for this process.
6. Rhythmic epileptic activity of large areas of the cortex synchronized in one hemisphere or bilaterally synchronous from homologous regions of the two

hemispheres, most probably has its pacemaker in the thalamus since from the thalamus such rhythmic bilateral disturbances can be induced by local electrical stimulation. Other subcortical projection systems may also be involved.

7. Local cortical epileptic discharge may also be initiated by local thalamic stimulation of the more directly projecting thalamic nuclei.

8. Subcortical rhythmic systems, projecting to large areas of both hemispheres can also be actuated by local cortical epileptic discharge, most readily in certain portions of frontal and temporal regions.

9. The clinical pattern of an epileptic seizure is not closely related to the form of associated EEG disturbance but rather to the functional area of the brain primarily involved and the functional characteristics of the neuronal circuits involved in the path of spread.
(Author's abstr.)

Influence of Drugs on the Human Electroencephalogram.

The interrelationships of pharmacology, seizures and dysrhythmia are discussed. Correlations have been made between clinical and electroencephalographic improvement in 100 patients receiving drug therapy. The two follow a broadly parallel course, changes in seizures and tracings being grouped simply as normal, improved or unimproved. In 66 per cent. of 108 periods of treatment, there was complete correlation. In 30 per cent. clinical improvement exceeded electrical improvement, in four per cent. the reverse was true. Clinical improvement and also complete correlation between seizures and dysrhythmia was more evident in patients with *petit mal* (73 per cent. correlation) than in those with other types of seizures (57 per cent. correlation).

Medication seems to influence seizures, or an "externalizing mechanism" before it influences the dysrhythmia of an interseizure recording. Broadly speaking, repeated electroencephalograms assist in judging the progress of treatment and the prognosis of epilepsy.
(Author's abstr.)

The Central Effects of Rhythmic Sensory Stimulation.

1. Records obtained during photic stimulation may be described in terms of the following components, any or all of which may be present at any one time or from time to time.

(a) A series of discrete elementary evoked responses.

(b) Fusion of evoked responses giving an accidental appearance of rhythmicity.

(c) Instrumental summation of evoked response and spontaneous rhythms.

(d) True augmentation or "driving" of local rhythms at the frequency of the stimulus.

(e) Augmentation of harmonically related rhythms in other areas.

2. Differences between individuals are attributable in some cases to anatomical variations and correlate also to some extent with the character of their spontaneous activity, with age and with differences in personality.

3. Alterations in the response in given individuals are produced by somatic, mental and emotional changes whether spontaneous, voluntary or induced.

4. Somatic, mental and emotional changes can be induced in the subject by stimulation at appropriate frequencies.

5. The above effects can interact with one another in both regenerative and degenerative fashion.

6. Subjective visual effects are attributable to interference between rhythmic evoked responses and spontaneous rhythms at cortical and possibly thalamic levels.

7. Anomalous (non-visual) effects in normal and abnormal subjects are attributed to interaction between the evoked activity and harmonically related spontaneous rhythms in other circuits at a thalamic level.

8. Evocation of activity in non-visual circuits can be used to study their physiology and as an aid to diagnosis of some pathological conditions.

9. Some theoretical implications of these findings are speculatively discussed.
(Authors' abstr.)

Electroretinogram of Man.

A method of perimetric electroretinography is described by means of which the action of duration, intensity, colour and location of the light stimuli on the human ERG can be studied.

The analysis of more than 1,800 records confirms that the human ERG belongs to Granit's E type. Its most characteristic feature is the *b* potential, quantitatively defined by the latency, the duration of the ascendant phase or culmination time, and the amplitude, *a* and *c* potentials are small and often variable. There is no positive off-effect.

Binocular electroretinography elicits, together with a normal ERG in the illuminated eye, a consensual response in the other eye, a reaction which seems to be coincident with the pupillary consensual reflex.

The ability of the retina to differentiate light changes can be measured objectively by the fusion frequency of the small *b* potentials, elicited by flicker stimulation. The fusion occurs normally at a rate of more than 19-20, often of more than 26 flashes per second.

The ERG in man varies not only with the duration, but also with the intensity of the stimulus. Increase of intensity produces a decrease in the latency and culmination time of potential *b*, as well as an increase in its amplitude.

Perimetric electroretinography permits the study of the reactivity of various retinal areas and the objective delimitation of the visual field. In the normal subject, stimulation of peripheral areas (60° nasal retina) produces an ERG with longer latency and culmination time, and smaller amplitude of the *b* potential than those elicited by stimulation of more central areas.

Stimulation of the retina with monochromatic light stimuli elicits: (1) A photopic component, particularly marked when the central area of the retina, adapted to light, is stimulated with red light; (2) a scotopic component, with slow and broad "*b*" potential, particularly marked when the peripheral area of the retina, adapted to darkness, is stimulated with blue light. This scotopic response shows a longer culmination time when the wave-length of the stimulus decreases; it reaches its maximum when the peripheral retina is stimulated with blue light.

Simultaneous recording of ERG and EEG permits measurement of the retino-cortical time, as well as of the alpha-blocking time. The retino-cortical time, that is, the latency of the evoked potentials, is more constant than the alpha-blocking time, being only 50 m.sec. (± 15). Measurement of the retinal time, the retino-cortical time, and the alpha-blocking time can provide useful information about the functional state of the various sections of the visual tracts and centres.

(Author's abstr.)

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Operational Strain : Psychological Casualties in the Royal Navy.

Psychological casualties are rather more frequent ashore than afloat. This striking discrepancy is not to be wholly explained by the concentration of the despised and rejected ashore. The author does not believe the men who report sick ashore with psychiatric symptoms do so mainly to evade their draft or their duty nor that they fake their symptoms. Rather he believes that reduction of tension ashore coupled with the uncomfortable consciousness of reduced speed and with inability to adjust easily to the different tempo makes for the greater incidence of psychiatric problems ashore. Like the difficulties and breakdowns occurring in civilian life on retirement, the naval men ashore miss the stimulation to which they are accustomed, even if unpleasant, and cannot stand doing nothing. Leadership qualities of that remarkable caste, the regular naval executive officer, may contribute to the lower incidence of psychiatric problems afloat.

F. C. SUMNER (Psychol. Abstr.)

Operational Strain : Experiences with the Middle East Force.

From the author's experience with psychiatric casualties in the Middle East Force certain proposals are made for reducing such casualties, namely: (1) a ruthless selection of psychological screening; (2) 2 beds for psychiatric casualties per 1,000 of the force; (3) first aid treatment of psychological casualties which the author summarizes in the simple text: "Fluid, food, sleep and stool"; (4) good rehabilitation; (5) an organization which will get recovered men back to their duty with the minimum of waiting and with a pleasant reception into the unit; (6) re-selection of men before returning them in order that suitable fresh employment may be found.

F. C. SUMNER (Psychol. Abstr.)

Exhaustion in Relation to Fighting Efficiency; Reactions of Men to Long Periods in Open Boats.

Here is described the psychological state of torpedoed sailors spending 10, 20 or 30 days in an open boat under severe physical conditions, and in the company of shipmates who are becoming delirious or who are dying off one by one. The earliest mental changes are affective in nature, ranging from acute anxiety while struggling in the water to wild elation when picked up. Agonal bioscopic fantasies, panoramic memories and the like frequently occur while a man is fighting for his life in the water. As hardships pile up amongst the lifeboat company the sensorium becomes clouded as evidenced in a defective appreciation of time, increasing lack of awareness, a tendency to day-dream of food and drink, and later in fantasy-building, in actual vivid hallucinations usually visual, and in delirium. Behavior of the men within the life-boat exhibits mob-psychology features: hysterical suggestibility, exaggerated dependence upon person assuming command, mental contagion, impression of a "presence," visual hallucinations of rescue ships common to the group. After rescue the mental state is usually one of euphoria followed by motor restlessness and insomnia as the physical exhaustion and mental distress wear off. Late reactions of an anxiety-type are common. Persistent psychiatric incapacity is the exception, occurring in only 50 out of the author's series of 285 shipwrecked sailors.

F. C. SUMNER (Psychol. Abstr.)

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A Study of Schizophrenic Language.

If "word identification" is thought of as the way in which schizophrenics interpret, or misinterpret, language, then we might say that: (1) Schizophrenics are unwilling to attempt an interpretation of confused language while normals are willing. (2) When they do interpret, schizophrenics prefer to "see" confused language as whole words rather than as letters. This they do even though nonsense words result. It would seem that schizophrenics need to make generalizations of what is confused or blurred even though the generalization, a word in this instance, may not make sense.

If "word arrangement" is thought of as the way in which schizophrenics categorize language, then it appears that: (1) Schizophrenics group into complex patterns rather than into simple categories. (2) Schizophrenics avoid personal themes, preferring moral and impersonal themes of morality, religion, life and death. These findings in general concur with those of Kasanin who used Vigotsky's object sorting test. Kasanin observed that schizophrenics failed to group

as do normals, but substituted broad principles of classification which were difficult to analyze. This is true in language also. However, while Kasanin found schizophrenics "personalizing" inanimate objects, we find them "de-personalizing" language although most normals use personal references. Universal themes, of quite a complex nature, are substituted for the simpler "What I like—what I dislike" sorting of the normals. It might be conjectured from this that schizophrenics, lacking a feeling of personal identification with the normal world, personalize the impersonal as an alternative, creating an identity with moral and universal ideas. The universal themes found in this study suggest that the patient was identifying himself with humanity in general, rather than with himself.

Another of Kasanin's observations with regard to object sorting is corroborated, namely, that schizophrenics find it difficult to shift from one category to another. Schizophrenics found it more difficult to change their word sortings, often holding to their initial grouping. Kasanin found they held their initial classification even after the correct solution was explained.

While Cameron's work was based also on Vigotsky's sorting test, more attention was paid to the patient's explanation of his actions. These protocols were similar to the sorting and explanation required in this study. Cameron observed that the patient's explanations were inclusive and involved. He has explained his results as due to inadequate role-taking skills. Not being able to see his own behaviour as others see it, the schizophrenic, in Cameron's opinion, has lost the social function of language. To this writer, however, language is a means of communication, and in schizophrenic language we find that the schizophrenic is communicating with such universalities as "God," "life," "body," or "every child." These concepts have become part of his social intercourse, and for that reason the complex and impersonal language which he uses becomes an appropriate means of communication with humanity and the infinite.

Of the "word sentences" test, we conclude that: (a) Schizophrenics persevere in language, lacking the variability of normals; (b) schizophrenics lack completeness of thought; (c) schizophrenics avoid personal reference in language. In this part of the study, an experimental technique was used to test Bleuler's and Kraepelin's descriptions of schizophrenic language. The point must be stressed again that the patients in the author's experiment were studied early in their hospital course, and undoubtedly do not represent the more serious stage of the illness observed by these two clinicians. Since many of Bleuler's and Kraepelin's signs were not found in the author's group, we might conclude that neologisms, rhyming, akataphasia, word salads, condensations and symbolization do not appear early in schizophrenia but do appear in "demented" *præcox*. Both Bleuler and Kraepelin, however, made note of perseveration or stereotypy, which appeared in this study. This last fact suggests the earlier appearance of stereotypy in the illness than of the other types of language disorders. Bleuler also noted the tendency toward generalizations. This also was shown in this study in a related way, in the use of impersonal sentences instead of personal. Schizophrenics are not as simple, direct, or personal in the formation of their language as are normals.

The perseverative quality in schizophrenic language was also found by Woods in his patients. What Woods calls an "inexact" or "indefinite" type of speech "a tendency to great vagueness," may again be the lack of personalization which was revealed in the present groups. However, the occurrence of "slipping" and metaphors, which Woods observed, are not corroborated by this study. This suggests that these signs are more typical of an advanced stage. Woods' patients were from a state hospital, rather than a private one, and probably had been ill for a longer period of time than had the present group, since his group included deteriorated schizophrenics. (Author's abstr.)

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Learning Ability in Rats Given Electroconvulsive Shocks in Late Infancy.

Twenty-nine albino rats were given a daily electroconvulsive shock from the age of 20 to 29 days. From 74 to 90 days post shock (average age, 113 days) they and 27 littermate controls were trained on the Stone multiple-T maze.

Performances of the control group were superior in terms of the percentage of animals attaining a criterion of mastery (3 perfect runs in succession) and in number of forward going errors made in 40 trials. When the performances of these groups were compared with those of comparable groups in two earlier experiments, uniform differences were found between the shocked and the unshocked, without regard to the amount of time allowed for recovery between the series of convulsions and the period of testing. In this as well as the foregoing studies the groups did not differ significantly in rates of running; also, there were no differences which could rightly be attributable to emotional disturbances among the experimentals.

These findings are interpreted as indicating that: (1) ECS effects a small permanent decrement in ability to learn a relatively difficult maze; (2) this decrement is most likely due to brain injury, from which partial recovery is rapid, and (3) the degree of defect is relatively uniform in all individuals of a homogeneous group of rats. (Authors' abstr.)

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Effects of Electroconvulsive Shocks on Rat Behavior in a Dashiell-type of Water Maze.

1. In the free choice situation provided by a Dashiell-type of water maze, normal rats learned to take an "economical" (minimal distance) path. Repetition of a particular "economical" route was common, and among the control group this was most frequently a central alternation path.

2. The shocked group covered longer distances and made a significantly greater number of reversals of direction with respect to the goal than did the controls.

3. The shocked group showed less repetition of particular "economical" routes than did the controls and a greater preference for the peripheral routes. In the shocked animals the evolution of a central-path preference began after the cessation of the shock series, whereas it was almost immediately perceptible in the control group.

4. The convulsed rats, alone, developed a tenseness and fear-like reaction to being removed from their cages and to being placed in the maze. This was rapidly lost after the shock period ended.

5. In problems requiring the acquisition of new routes from start to exit, begun 16 and 26 days after cessation of shocks, the convulsed group showed no certain handicap in habit formation as compared with the controls.

(Authors' abstr.)

The Retroactive Effect of Electroshock on Learning.

1. Nine groups of animals were trained to avoid a charged grid. One trial per day was given on each of 18 days. Eight of the groups received an electroshock of 85 volts A.C. passed through the head for a .2 second at a certain time after

each trial, the time differing for different groups. The control group was run in the same way but received no cerebral shock. Learning was measured by the number of trials in which the animals avoided the grid charge by running before the end of the 10 second CS-US interval.

2. There was a very marked depression of learning in the group which received the convulsive shock 20 seconds after each trial. The depression became progressively less in the 40 second, 1 minute, 4 minute and 15 minute groups. Animals with longer trial-shock intervals (1 hour, 4 hour and 14 hour) did not differ significantly from the controls.

3. An additional control experiment was performed in which four groups of rats were run in the same way as the eight cerebral shock groups but in which the shock following each trial was applied to the back legs. In different groups the leg shock was administered at different times after each trial.

4. In the control experiment only the group of animals shocked through the legs 20 seconds after the daily run showed significantly slower learning. Animals shocked through the legs 60 seconds, 4 minutes, or 45 minutes after each trial showed no impairment in learning. This supports the argument that cerebral shock, at least in the 60 second or longer groups, did not inhibit learning by acting as a punishment.

5. The results were interpreted in terms of a consolidation theory. It was suggested that newly learned material undergoes a period of consolidation or perseveration. Early in this period a cerebral electroshock may practically wipe out the effect of learning. The material rapidly becomes more resistant to such disruption; at the end of an hour no retroactive effect of cerebral electroshock was found. (Author's abstr.)

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*Effects of ECT on Retention in Rats as Functions of Intensity of ECT Stimulus. <i>Townsend, J. C., et al.</i>	148

Duration of Decrements in Learning and Retention Following Electroshock Convulsions in the White Rat.

This report has described certain experiments which were conducted to determine the duration of the decrements in learning and retention following a series of 25 electroshock convulsions. The Pittsburgh Electroshock Apparatus was employed and insured adequate control of relevant instrumental variables, the most important being the amperage and duration of the electroshock impulse. All learning and retention tests were conducted in the Lashley 111 maze which was slightly modified and adapted for swimming. The 257 animals used were of the Sprague-Dawley strain and were 105 days old at the beginning of each study. At this time their mean weight was 330 grammes.

To ascertain the duration of the impairment in learning, tests were made 24 hours and 30 days after the completion of the series of convulsions. The duration of the decrement in retention was studied by testing for retention at intervals of 24 hours, 30 days, and 60 days following the last convulsion.

The results of these experiments show that a controlled series of 25 electroshock convulsions is followed by a significant impairment of learning ability immediately

after the shock series and that this impairment is still evident 30 days following treatment. In the latter case, the magnitude of the impairment is not as great as that which is found immediately after the shock series.

A decrement in retention also appears 60 days after the convulsive series. This impairment is at least as great as that which was demonstrated immediately after the convulsions.

A controlled series of electroshock convulsions results in occasional paralysis, as well as significant weight losses in the course of the convulsive series.

With the termination of the convulsions, however, these weight losses are eventually overcome. (Authors' abstr.)

The Effects of Electroconvulsive Shocks on Gestation and Maternal Behaviour. I.

The present paper is the first of two reporting the results of an investigation to survey the effect of electroconvulsive shock on gestation and on innately organized patterns of behaviour in the albino rat. For the latter, parturition, nest building, lactation, and retrieving, which are components of maternal behaviour, were used. It was found that:

1. Shocks administered in the latter half of pregnancy do not cause the animal to abort, but prolong gestation and make labor difficult.
2. Electroconvulsive shocks obliterate maternal behaviour if initiated during the last 12 to 15 days of pregnancy and continued until one day post partum.
3. If the series of shocks is applied during the first fifteen days of lactation, maternal behaviour is affected to a considerable degree, but not obliterated. If shock is initiated on the seventh day post partum, i.e., after nest building, lactation and care of young are well established, the disruption is minimal.
4. The severity of the disruption is related to the period of the reproductive cycle during which the shocks are applied.
5. The growth of the young is temporarily retarded if the shocks are applied to the mothers during the lactation period.
6. The effects of the shock did not appear to persist so long as 25 days post-shock.
7. Except possibly in the most severe disturbances, there are great individual differences in the resistance of mothers to the disruptive effects of shock, but when the effects appear, they may be observed, as a rule, in all components of maternal behaviour, although in a variable degree. (Author's abstr.)

Effects of Electroshock Convulsions on Learning and Retention in Rats as Functions of Difficulty of the Task.

In general these results indicate that a series of controlled electroshock convulsions does not affect learning and retention, either immediate or delayed, of a habit at the relatively simple level of difficulty of the straightaway or the single-choice-point maze. These results tend to substantiate conclusions drawn by other research workers studying relatively simple habits under other less adequately controlled conditions.

The major contribution of the present research lies in a comparison of these results of another series of experiments in which an exact duplication of the conditions of the present research existed with the exception of the relative difficulty of the maze habit studied. In this latter instance a five-choice-point maze was employed and very significant decrements in both learning and retention—immediate and delayed—were observed. Since the only difference between the two research designs was the relative difficulty of the tasks to be learned and retained the conclusions seems warranted that the effects of electroshock convulsions on learning and retention are, in part at least, functions of the difficulty of the task or habit involved. (Author's abstr.)

Effects of Electroshock Convulsions on the Retention in Rats as Functions of Intensity of Electroshock Stimulus.

1. Decrements in retention of the maze habit, significant at the one per cent. level of confidence, did occur immediately following the series of controlled electroshock convulsions.

2. The magnitude of these decrements in retention were not related to the intensity of the electroshock impulses employed to induce the convulsions.
3. No latent effects of the convulsions on the relearned habits were evidenced 30 days following immediate post-shock relearning of the maze.
4. Characteristic intraserial learning curves were found for learning both before and after convulsions.
5. Changes in mean weights of the animals occurred during the series of convulsions. A marked loss in weight followed immediately after the start of the series of convulsions, reaching an asymptotic level at approximately the fifteenth daily convulsion. At this point, a gradual increase began which was accelerated rapidly following the last shock treatment. (Authors' abstr.)

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Self-Inflicted Prefrontal Lobotomy. A Case Report.

(1) A case is presented of a 63-year-old man who attempted suicide by shooting himself in the right temple with a revolver.

(2) After nine weeks of hospitalization he was admitted to the Columbus State Hospital because of the residue of his injury.

(3) An attempt is made to deduce the reasons for the attempted suicide by an evaluation of the patient's personality difficulties and the cortical degenerative changes, both of which were related to the patient's chronic alcoholism.

(4) Neurologic findings were minimal, and could be related to the proximity of the path of the bullet to the middle frontal gyrus.

(5) The chief defects found were in the higher mental functions and resembled closely those found after prefrontal lobotomy. The course of the illness and the present status of the patient are described and correlated with those of a surgical prefrontal lobotomy. (Authors' abstr.)

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The Electroencephalogram in Scleroderma.

(1) Fifty-six patients with scleroderma were found to have abnormal electroencephalograms in 84 per cent. of cases.

(2) The abnormalities consisted mostly of "slow" patterns, 32 per cent. and convulsive patterns, 21 per cent.

(3) The majority of the records were borderline or mild, fewer moderate and few severe.

(4) The degree of abnormality was not related to the severity or extent of the sclerodermatous process or to its duration.

(5) There is no general correlation between a unilateral predominance and the EEG abnormality and a unilateral or contralateral sclerodermatous process.

(6) It is suggested that a decrease in the ionized calcium in the fluid environment of nervous tissue might be a factor in the EEG abnormality.

(Authors' abstr.)

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The Wechsler-Bellevue Scale and the Substitution Test as Aids in Neuro- psychiatric Diagnosis. <i>Hewson, L. R.</i>	158

Intensive Electroplexy.

Electroplexy, used on an intensive schedule (once a day or more frequently), is qualitatively different in its therapeutic value and side effects from the orthodox course of more widely-spaced doses. It is the preferable technique in some conditions, giving a quicker initial response; and also may produce remissions in some patients who fail with orthodox courses, but in this case maintenance doses or further intensive treatment may be required, possibly until the natural term of the psychosis is terminated. Dramatic but frequently unstable remissions may be obtained in unpromising cases. The effect of intensive treatment in 21 cases is described.

With intensive ECT there appears to be a speeding up of the "cumulative phase" of electroplexy, and it is suggested that in some conditions treatment $\times 2-3$ /week is too infrequent to allow the therapeutic "cumulative phase" to occur.

There is some evidence suggesting that in recoverable cases the period of hospitalization may be shortened if intensive ECT is applicable; however, it is not usually possible to reduce the total number of necessary convulsions by using treatment intensively.

In the cases under review, intensive treatment was found of value (roughly in order of usefulness) in the following conditions:

- (1) Acute psychosis with refusal of food.
- (2) Acute mania.
- (3) The paranoid type of involutional psychosis.
- (4) Paranoid psychosis.

If ECT is to be used at all in patients demonstrating the above conditions, the primary use of the intensive method is recommended. Intensive therapy

may also be used (5) in reducing tension in some cases of chronic mental illness ; (6) in some atypical depressions. In schizophrenia it is of little permanent value.

No hard and fast rules can be laid down on the subject of spacing treatments, and adherence to any rigid schedule is deleterious ; the treatment of the individual case must be reviewed from day to day. With intensive methods, treatment may be initiated π 1/day or oftener according to the severity of the presenting symptoms, and continued until the gross features of the psychosis are broken up, after which the rate of giving treatment is reduced by half and continued until a fair degree of improvement is obtained ; it seems preferable to stop just short of producing severe amnesic-confusional symptoms. Treatment is then continued with spaced doses, and maintenance doses if required. The physical complications of ECT do not appear to be increased by its employment intensively. For reasons of time and distance, a late follow-up cannot be presented. (Author's abstr.)

MARCH.

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The Wechsler-Bellevue Scale and the Substitution Test as Aids in Neuro-psychiatric Diagnosis. <i>Hewson, L. R.</i>	246

Some Observations on Lobotomized Patients Based Upon Routine Neurologic Examinations.

From observations based on routine neurologic examinations, it is concluded that prefrontal lobotomy induces in all cases regardless of the type of psychosis : (1) a period of marked reduction in spontaneous motor activity association with a short attention span and a poverty of mental content ; (2) a period of loss of automatic higher center control over reflex emptying of the urinary bladder ; (3) an excessive reactivity to stimuli of pain applied to the body surface, especially to the sole of the foot, which is possibly permanent. For a few days postoperatively there is generalized reduction in muscle tone. But otherwise, there is no disturbance in volitional movement, motor co-ordination or perception.

The explanations of these observations on lobotomized patients cannot be established with certainty. However, the similarity of the altered bladder function and reaction to pin pricks to that of normal children suggests that lobotomy interrupts the mechanism of acquired automatic control over these functions.

A pain stimulus applied to the sole of the foot of all individuals induces simultaneously the protective reflex of withdrawal and the perception of the stimulus. The average adult integrates the stimulus into his awareness of the situation and when the stimulus is a part of a medical examination the reaction of withdrawal of the affected limb may be completely inhibited. This inhibition of the basic reflex of withdrawal in the average adult is automatic, yet variable in degree, depending on the circumstances at the moment of the stimulus. The apparent inability of the lobotomized individual to inhibit the reaction of withdrawal makes it reasonable to conclude that the operation lobotomy interrupts nerve pathways involved in the function of control of some basic reflex patterns.

(Author's abstr.)

Experimental Production of Convulsive Seizures.

(1) Eight anesthetized adult rabbits (one male and one female from each of four litters) were given intracranial injections of 3 c.c. of equal parts of acetone and physiologic saline on alternative days.

(2) Each injection was followed by a convulsive seizure beginning from 5 to 15 seconds after the injection.

(3) Three animals exhibited convulsive seizures between injections.

(4) Analysis by the ether extraction method to determine the possible solvent effect of acetone, indicated a mean brain dry weight of 16.025 gm. and a residue of 8.93 gm. with a mean fat content of 7.0925 gm.

(5) A similar analysis of the brains of 4 controls gave a mean brain dry weight of 16.6725 gm. and a residue of 9.04 gm. with a mean fat content of 7.630 gm.

(6) Statistical treatment indicated the difference in residue weight between the control and experimental group was not significant.

(7) Statistical treatment indicated a significant difference in the fat content of the two groups.

(8) The conclusion may tentatively be drawn that the convulsions following injections were due to the immediate fat solvent effect of the acetone.

(9) The seizures occurring between injections may have been due to the reduced lipin and lipid of the brain.

(10) No significant difference was observed in the reactions of, or effect upon, male as against female animals.

(11) Individual differences in the effect upon specific animals were observed but the basis of the difference was not determined. (Authors' abstr.)

Allergy and Psychoneuroses.

The clinical picture presented by the allergic individual is clouded by psychoneurotic manifestations in a great number of patients. Many reactions from medicines and hyposensitization treatments are on a fear basis, and not an allergic one. Many allergic seizures which cannot be explained on a basis of increased exposure to allergens can be explained on the basis of a complicating emotional experience. A neurosis complicating allergy requires recognition and treatment.

(Author's abstr.)

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Anticonvulsive Action of Paraldehyde.

Paraldehyde is a substance with little toxicity that can be injected intravenously in doses of up to 0.2 c.c. per kg. without any ill-effects. Large doses have a narcotic action.

The motor responses of the cerebral cortex of the cat and human beings are greatly reduced or abolished by small doses of paraldehyde. The convulsive attacks produced in the course of neurosurgical operations by cortical stimulation are immediately stopped by paraldehyde.

Paraldehyde reduces or abolishes for some minutes the spontaneous cortical activity of the cat according to the dose employed. Convulsive discharges of the cortex elicited by leptazol disappear immediately with the injection of paraldehyde.

The anticonvulsive action is also very striking in animals injected with different convulsant drugs. A dose of paraldehyde protects an animal against large doses of strychnine and leptazol. The anticonvulsive action appears also in the decerebrate and spinal preparations. Clinically, paraldehyde has been used in many cases to stop operative or postoperative convulsions that in some cases may reach serious proportions.

The depressing action of paraldehyde has also been demonstrated on the peripheral neuromuscular junctions and on the ganglion synapses, although the action is more marked on the cerebral cortex.

The theoretical implications and mechanism of action of paraldehyde are briefly discussed. This substance is recommended in doses of 0.05 to 0.1 c.c.

per kg. intravenously as the best agent that we actually have to break and stop a convulsive discharge. The dose may be repeated if necessary.

(Authors' abstr.)

Syncope and Seizures.

1. One hundred and fourteen patients have been described having syncopal spells and episodes of transient dizziness, blurring of vision, "blackout," abdominal sensations, and weakness with or without loss of consciousness. No definite convulsions occurred in any of them although in one instance a seizure was produced during the hydration and pitressin test.

2. All these patients had pathological EEG records between spells, the commonest type of abnormality being a diffuse dysrhythmia (65 per cent.).

3. These spells were essentially the same as the vagal and vasovagal attacks described by Gowers, and the EEG disturbances indicate that they are fundamentally epileptic in character.

4. The form of the pathological EEG abnormality and the character of the spells suggest a subcortical and probably hypothalamic origin.

5. For this reason, and the fact that convulsive seizures do not occur, and also because of the personal and social stigmata attached to the diagnosis of epilepsy, the term "encephalosyncope" is suggested as a diagnosis for these patients. It is in effect a mild form of idiopathic epilepsy.

6. In several instances a focal abnormality in the temporal region can be isolated by the EEG and these patients have ictal automatisms. These are cases of focal cortical temporal lobe seizures.

7. The term "psychomotor discharges" is misleading when used to describe an EEG abnormality since so-called "psychomotor" attacks are not always associated with such discharges and vice versa. Attempts to correlate this pattern of EEG abnormality with clinical syndromes may lead to considerable confusion.

(Author's abstr.)

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Return of Sensation after Experimentally Produced Lesions in Sciatic Nerve of Cat.

The area of analgesia after section of the saphenous major, tibial, peroneal and sural nerves of the cat's leg have been described. The sensory supply of the whole sciatic nerve has been outlined and the extent of the loss was shown in accordance with the sural nerves involved.

The terminology of sensory loss and sensory regeneration is not well defined and it is suggested that some uniformity be accepted. The anatomic sensory supply of a nerve should be considered to be that area represented by the loss of light touch immediately after section of that nerve. The area within the periphery of the anatomic sensory supply has preservation of pain as a result of dual innervation or intermediate zone. When other nerves adjacent to one left intact are severed, the area preserved sensibility is called the residual supply of the nerve.

When some time has elapsed after section of a nerve and the area of analgesia continues to shrink without regeneration, this shrinkage is due to overlap and is brought about by the ingrowth of fibers from adjacent nerves. In this area there is recovery of deep pin-prick whereas the area of loss of touch remains constant.

Finally, the area which remains completely insensitive to all cutaneous sensations whatever time may have elapsed without regeneration is called the area of isolated supply. Any recovery within this area can result only from regeneration.

We have outlined the area of potential nerve overlap for the sciatic nerve of the cat. As in man, large areas of return of sensibility to pain within the anatomic supply of a nerve occur as the result of overlap when regeneration is impossible. The rate and manner of this return is described.

The rate and the completeness of return of sensibility to pin-prick is described after primary and secondary sutures. The recovery of sensation due to regeneration, as opposed to the return of sensation due to overlap, is often characterized by large areas becoming imperfectly sensitive as contrasted to shrinkage of the area of analgesia. No correlation was found between the recovery of sensation and of motion. As in man, motor recovery may be well advanced and sensory recovery may not have begun. As in man, pressure pain returned before sensibility to deep pin-prick.

The placing reaction occurred before return of cutaneous sensibility and was related to motor recovery and probably deep sensibility, to which there is a greater overlap than to pain.

When a suture was delayed for 60 days after section of a nerve, recovery of sensation of deep pin-prick was markedly delayed both as to time of first evidence of recovery and completeness of recovery. Moreover, often there were long periods of delay between a certain degree of recovery and a later progression. Furthermore, in a number of cases no sensory recovery occurred. (Authors' abstr.)

Acetylcholine and Convulsive Activity.

An investigation of the effects of cholinesterase-inhibiting substances and a stable acetylcholine homologue on the convulsive activity of the cat's cerebral cortex yielded the following results:

1. Eserine administered intravenously or applied directly to the exposed cortex was found to facilitate the convulsive response to a series of widely different chemical substances. This facilitation was characterized by a more rapid onset of convulsive activity, more frequent convulsive spikes, the elicitation of spikes by the combined application of eserine and the convulsant substance when the latter was ineffective by itself, and the re-evocation of convulsive activity on application of eserine to a previously spiking area which had apparently recovered from the effect of the convulsant substance.

2. Intravenously injected prostigmine, like eserine, exerted a facilitating effect on convulsive activity in doses which were without significant effect on blood pressure or heart rate.

3. The parasympathomimetic choline ester mecholyl applied to the cortex in conjunction with convulsant substances augmented their effect in a way similar to that described above for eserine. These results are interpreted as indicating a significant role of acetylcholine in the processes underlying cortical convulsive activity.

4. Di-isopropyl fluorophosphate was without effect on convulsive activity whether administered intravenously or applied directly to the cortex. The possible causes of this unexpected result with DFP are still under investigation.

(Authors' abstr.)

Effects of Direct and Reflex Nerve Stimulation on the Exocrine Secretory Activity of Pancreas.

With the pancreatic duct cannulated the effects of direct and reflex nerve stimulation on the exocrine secretory activity of the pancreas have been observed. Faradic stimulation of the vagi or of the splanchnic nerves with the pancreatic nerves intact augmented the rate of secretion. Direct faradic stimulation of the celiac plexus before or after functional degeneration of the parasympathic pre-ganglionic fibers also increased the flow of pancreatic juice. This result persisted following depression of the adrenergic nerves with ergotoxine phosphate. The postganglionic nerve supply to the pancreas thus includes cholinergic fibers which increases the rate of flow of pancreatic juice. Stimulation of the celiac ganglia under similar conditions, but with paralysis of cholinergic fibers by atropine sulphate resulted in an inhibition of the flow of pancreatic fluid. The postganglionic sympathetic nerve supply of the pancreas must also contain adrenergic components which retard the rate of flow of pancreatic juice. Stimulation of mesenteric

nerves resulted in a marked decrease of pancreatic secretion. This effect was obtained when all nerves to the pancreas were intact and when the vagi and the splanchnic nerves had been functionally degenerated. In the latter case, however, it was less pronounced. With vagus and splanchnic nerves degenerated the effect persisted following transection of the jejunum but disappeared when the celiac ganglia were extirpated. Reflexes from the intestine to the pancreas may hence be mediated in part through the splanchnic nerves and reflex centers in the central nervous system, but reflex pathways from the intestine to the pancreas which do not traverse the central nervous system undoubtedly exist and involve synaptic connections in the celiac ganglia.

Since Richins demonstrated that the sympathetic nerve components in the pancreas of the cat pass only to blood vessels, the pancreatic secretory responses to splanchnic and mesenteric nerve stimulation can probably be best explained as a result of alterations of blood flow through the gland. (Authors' abstr.)

Relationships Between Cerebral and Cerebellar Cortices in Cat.

1. Electrical stimulation of a number of the specific functional areas of the cerebral cortex in the cat evokes responses in related regions of the contralateral cortex.

2. Stimulation of somatic area I (postcentral homologue) evokes responses confined largely to the contralateral anterior lobe and lobulus simplex. The face subdivision projects to the simplex and upper culmen while the arm and leg subdivision projects to the lower culmen and centralis respectively. The projection of the trunk area overlaps part of the urea to which the arm and leg areas project.

3. Stimulation of somatic area II evokes responses confined largely to the contralateral paramedian lobule. The evidence was suggestive of face representation in the more rostral folia with the arm and leg being more caudally situated.

4. Auditory areas I and II project to the folium vermis and tuber vermis in an overlapping pattern, with the auditory area II projection concentrated somewhat caudally.

5. The autonomic center for the eyes situated on the medial wall of the cerebral cortex is represented primarily in the contralateral cerebellar hemisphere, the upper folia of the adjacent paramedian lobule and the lateral arm of lobulus simplex.

6. Duality of representation exists in the cerebellar cortex as it does in the cerebral cortex. (Author's abstr.)

Relation of Pain Sensory Threshold to Form of Mechanical Stimulator.

Pain thresholds of individual pain spots at their points of highest sensitivity have been tested by probes of various forms. Spherical stimulators have the advantages that their curvature gives a simple measure of the skin indentation at threshold; that they do not penetrate the epithelium; and that over a considerable range of sizes, threshold is reached when approximately the lower hemispherical surface has been pressed into contact with the skin surface. Under these circumstances the plot of grams force per area of hemisphere, or per radius squared, gives approximately constant values of threshold over a considerable range of sizes. Deviations from constancy at either end of this range can be accounted for by simple mechanical factors whose effect is minimal in the constant range.

Over this range, it may be inferred that the constant factor of stimulation at threshold is lateral stretch of the subepithelial nerve net. Since fibers reaching the skin under each sensory focus turn horizontally into the net, lengthwise stretch of nerve terminals appears to be the effective stimulus for pain endings in mechanical distortion of the skin.

Other simple experiments and casual experiences agree with this inference to the extent of demonstrating that in the absence of inflammation, stretch is a most effective stimulus for skin pain endings. (Author's abstr.)

Actions of Anti-cholinesterases on Endplate Potential of Frog Muscle.

A systematic study has been made on the effects produced on the endplate potential (e.p.p.) of the curarized frog's sartorius by seven anti-cholinesterases.

All slow the time course of the e.p.p. set us by single or repetitive nerve volleys and increase the relative size (voltage) of the slowly decaying component.

Four criteria have been adopted in order to express graphically the concentration action relationship for these seven substances in respect both of the time course of the e.p.p. and of the relative size of the slowly-decaying component.

Each of the four criteria increases along a sigmoid curve when plotted against the negative logarithm of the prostigmine concentration, and this relationship also appears to hold with the other anti-cholinesterases.

For any one criterion there are wide divergences in the activities of the substances, prostigmine being the most effective and DFP usually the least. However, the relative activities assessed by the four criteria are in good agreement, a finding which is inherently probable, for all four criteria have been chosen because they are likely to assess anti-cholinesterase activity.

In contrast, the curare-like depressant action of all seven substances diverges widely from these assumed anti-cholinesterase activities.

By the above four criteria for testing anti-cholinesterase activity *in vivo*, the concentration for half effectiveness has to be much higher than with *in vitro* testing, but less so with prostigmine than with others. Presumably this discrepancy is attributable to the special type of cholinesterase at the frog's endplate.

The ACh hypothesis of neuro-muscular transmission is fully in accord with all the observations, which themselves throw light on the detailed mechanisms involved in this transmission—in particular the removal of ACh from the site of its action and the generation of the slow component of the endplate potential.

The concentration-action curves of prostigmine as determined *in vivo* are discussed in relationship to the concentration-inhibition curves for *in vitro* inhibition of ChE, and are shown to correspond to a monomolecular inhibitory action on an enzyme of low concentration. (Authors' abstr.)

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- *Effects of Barbiturates and Ether on Spontaneous Electrical Activity of Dog Brain. *Swank, R. L., and Watson, C. W.* 137

Pattern of Tactile Representation in the Thalamus of the Cat.

1. Physiological excitation of cutaneous tactile receptors produces a localized potential change in the ventral nucleus of the cat's thalamus. This response is sufficiently characteristic to serve adequately as a means of mapping the pattern of tactile representation in the thalamus.

2. The responsive area in the thalamus is contained within but does not fill completely the pars externa arcuata of the ventral nuclear group.

3. The contralateral surface of the body is represented within this responsive area as a figure of the animal, with the tail pointed antero-laterally, face and mouth medially, the extremities inferiorly. The figure is distorted to allow greater volume representation of those parts of the body with the greatest innervation density. The dorsal midline portions of the body are represented in the continuity from nose to tail across the superior portions of the responsive area. Reversal of the representation of the cervical segments does not occur in the thalamus. An ipsilateral face area is present medial to points for mouth and contralateral face. No responses were recorded following stimulation of other parts of the ipsilateral body surface. (Authors' abstr.)

Effect of Preoccipital and Temporal Decortication on Learned Visual Discrimination in Monkeys.

1. Monkeys were trained in a visual form discrimination using a modified discrimination-box.

2. The discrimination habit was abolished by one-stage, bilateral extirpation of cortical areas 18 and 19, but was reacquired with postoperative retraining (monkey D-1).

3. With training trials presented between operations, seriatim destruction of areas 18 and 19 produces no habit-loss after either operation. Subsequent bitemporal decortication resulted in a postoperative amnesia which could not be overcome with prolonged retraining (monkey D-2).

4. The habit was retained following bitemporal decortication (monkey D-4) and was acquired initially in the absence of these (monkey D-3). Subsequent bilateral removal of areas 18 and 19 permanently abolished the form discrimination, although both animals readily learned a simple brightness-discrimination in the same apparatus. (Authors' abstr.)

Irritability of Mammalian Nerve Following Ischemia.

The peroneal nerve in the cat is cut and enclosed in a glass of electrode filled with Ringer's solution where it is stimulated by single shocks from an inductorium. The blood supply to the nerve is isolated at the knee, and the circulation in the nerve is observed through the glass.

Clamping the vessels results in a cessation of circulation in the nerve as observed through the glass electrode.

Cessation of circulation results (after a variable interval up to 7 min.) in an increase in irritability of the nerve as shown by increased contractions of the tibialis anticus muscle.

Removal of the clamp on the blood vessels at the height of contractions returns the nerve to the initial condition in an average of 2.5 minutes. The experiment may be immediately repeated when this occurs.

If the clamp on the blood vessel is not removed the nerve loses its irritability after an interval varying from 10 to 26 minutes. After returning the circulation to the nerve, a recovery period of possibly up to an hour is necessary before the nerve responds again to the original stimulus. If it does not thus recover, an increase in the strength of the stimulus may permit the continuation of the experiment.

A good preparation may be used for hours for repeated demonstrations of the effect of ischemia. It is suggested that these observations may have a bearing on the question of ischemic pain. (Authors' abstr.)

Study of Multiplied Cortical Responses to Repetitive Stimulation in the Thalamus.

Repetitive stimulation of the lateral geniculate nucleus in the rabbit anaesthetized lightly with ether is likely to exaggerate the voltage of the fast deflections (specific response) which occur in the cortex following stimulation in the thalamus, and to cause these waves to discharge spontaneously, independent of the stimulus sequence, and to continue to do so after stimulation ceases. Since a specific repetitive response of this magnitude so obscures the alpha waves as to appear to replace them, or may do so in fact, the multiplied response to the stimulus effectively constitutes the whole record.

In the authors' experience it is unlikely for after-discharge to occur in the post-stimulatory period unless preceded by multiplied response in the stimulatory phase. The maximal after-discharge follows when termination of stimulation occurs during the height of the response, in other words, the paroxysm initiated during stimulation merely continues into the post-stimulatory phase. The authors believe that the repetitive discharge of the specific response mechanism in paroxysms is assignable to the same neural elements as those which summate their activities to produce the strychnine spikes. Like that of strychnine, the paroxysmal reaction is readily blocked by ether and is prone to spread rather widely during the later phases of an experiment.

The experiments offer further proof for the existence of two functionally distinct but complexly interrelated neural mechanisms of cortex generally. They indicate

that the paroxysmal discharges of which convulsive phenomena consist represent an abnormally intense activity disorder of the specific response mechanism and do not necessarily involve the alpha rhythm mechanism.

An alternative possibility is afforded for explaining multiple frequencies that occur transiently in the electroencephalogram during photic driving: these may represent spontaneous discharges in the specific response mechanism rather than on and off responses to successive flashes. (Authors' abstr.)

Effects of Localized Cutaneous Stimulation on Circulation in Duodenal Arterioles and Capillary Beds.

The vasomotor activity of the arterioles and capillary beds of the duodenum during cutaneous stimulation with warmth and cold was studied by employing quick freezing and subsequent fixation of tissues with the freezing-drying technique.

During cutaneous application of warmth the arterioles in the subserosa and submucosa of the duodenum were dilated, and the capillary beds in the villi were engorged with blood. During application of cold the corresponding arterioles were constricted, and the capillary beds were ischemic.

The most pronounced vasoconstriction was observed in the larger arterioles located within the subserosa, but blood flow in these vessels was rapid during vasoconstriction as well as during vasodilatation. Constriction of these vessels could not be considered of greatest importance in regulation of blood flow through the capillary beds since the more peripheral arterioles in the submucosa of the duodenum under these conditions contained a considerable amount of blood. The vasomotor activity in the arterioles of the submucosa seemed more significant in this regard. While the tonic changes in these vessels were not so great as in the larger arterioles of the subserosa, the blood flowed rapidly only during vasodilatation with warm cutaneous stimulation and was slowed during vasoconstriction with cutaneous application of cold. The blood in the lumina of the constricted arterioles was congested. The congested blood exerted a damming effect which prevented the passage of blood cells into the capillary beds. The plasma which trickled through appeared to wash the formed elements of the blood out of the capillary beds and into the venous circulation. No active capillary constriction seemed necessary. Vasoconstriction in the arterioles of the submucosa was a rigidly controlled response to reflex nerve stimulation and is probably the most important nervous response directly regulating blood flow through the capillary beds. Vasodilator reflexes were more loosely regulated and are probably due to inhibition of muscle contraction with more passive muscle response.

(Authors' abstr.)

Effects of Barbiturates and Ether on Spontaneous Electrical Activity of Dog Brain.

The spontaneous electrical activity of the cerebral hemispheres of normal dogs and the changes produced in it by ether and the barbiturate drugs have been studied. The following observations were made:

1. The dominant spontaneous electrical activity of the brains of unanesthetized dogs at a low level of excitation is about $25 \pm$ per sec. A variable amount of $12 \pm$ per sec. and $50 \pm$ per sec. activity is usually present, the former being marked posteriorly and the latter more marked anteriorly. With enhancement of the excitatory state of the animal state of the animal, the $50 \pm$ per sec. activity is observed in the posterior portions of the brain under this circumstance.

2. During ether anesthesia the electroencephalogram is dominated by $50 \pm$ per sec. activity. During the induction period this occurred first in the parietal cortex and then in the premotor area. The amplitude of the electrical oscillations increased in the parietal and premotor areas, while at the same time the amplitude of the brain waves of the motor cortex decreased. Significant slowing of the brain waves during ether anesthesia was not observed until the anesthesia had become very deep.

3. The induction of sodium amytal narcosis was characterized electrographically by the early disappearance of the $50 \pm$ per sec. oscillations, then the loss of the $25 \pm$ per sec. activity, and finally by the loss of the $12 \pm$ per sec. waves. In the deeper narcosis a gradual slowing of frequencies occurred. The amplitude and frequency of the electric activity was altered least in the motor area. A

characteristic of barbiturate narcosis was that periodically decreased spontaneous electrical activity was followed by bursts ("suppression-burst" phenomena).

This was manifested in light narcosis by the "barbiturate bursts," and in deep narcosis by the bursts alternating with "blackouts." It is suggested that these phenomena are related to metabolic changes in the nerve cells concerned with the recovery and excitation processes of the neuron, since the excitability of neurons to electrical stimuli during "blackouts" was regained so slowly.

4. Electrical threshold studies of the cerebral cortex suggested that sodium amytal narcosis depressed the motor strip less than any other area of cortex.

5. It is suggested that sodium amytal and ether exert a selective effect upon nerve cells, based upon their size. Sodium amytal first affects the smaller neurons and later the larger ones. Ether, on the other hand, appears to act first on the larger neurons, and later on the smaller ones. (Authors' abstr.)

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*Selective Cortical Undercutting as a Means of Modifying and Studying Frontal Lobe Function in Man. <i>Scoville, W. B.</i>	65

Selective Cortical Undercutting As a Means of Modifying and Studying Frontal Lobe Function in Man. Preliminary Report of Forty-three Operative Cases.

1. Selective cortical undercutting constitutes a method of producing discrete cortical lesions in man without interference of the blood supply to adjacent areas of the brain.

2. Cortical undercutting is anatomically and surgically feasible and has certain technical advantages over cortical ablations, especially in speed, facility and preservation of blood supply.

3. A preliminary report is made of 43 cases of selective cortical undercutting of the frontal lobes.

4. The areas selected for undercutting have been areas 9 and 10 of Brodmann because of empiric success reported by others in the ablation or leucotomy of these areas, and the orbital and cingulate gyrus areas because of their known influence on the autonomic system and behavior of animals.

5. The operative technique is described, as well as a method of marking the undercut areas by wire loops.

6. The gross physiologic results have been largely of a negative nature.

7. The therapeutic results justify further investigation.

(Author's abstr.)

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When Cardiazol, When Electric Shock?

Cardiazol treatment by reason of the modification by Emma (simultaneous injection of cardiazol and grape sugar) has become again capable of competing with electro-shock treatment. The differences in the effectiveness of chemical and physical convulsive treatments are to be sure not great. In severe excitement-states of catatonic and hebephrenic stamp, even in non-organically conditioned states of confusion, cardiazol is found by the author to be the more positively and more intensively acting means. In paranoid and hallucinatory forms of schizophrenia, but particularly in dementia simplex, differences in the effectiveness of the two convulsive methods are less striking. Acute catatonia demands cardiazol treatment in massive form. Also in many depressions cardiazol treatment shows a greater effectiveness.

F. C. SUMNER (Psychol. Abstr.)

Smell and Taste Disturbances After Head Injuries.

The literature is reviewed and cases are presented bearing on smell and taste disturbances after head injuries. Smell disturbances occur quite frequently after head injuries. They consist in unilateral or bilateral hyposmia or anosmia which may be bound with spontaneous parosmias. They are conditioned by tearing of the fila olfactoria or by lesion of the bulbi or tractus olfactorii. Traumatic injuries to the central part of olfactory area (hippocampus formation) occur much more rarely and probably only in the case of penetrating brain injuries (shot wounds). They lead not to anosmia but to epileptic attacks of the uncinatus-type and to genuine olfactory hallucinations. Taste disturbances after head injuries, in so far as peripherally conditioned, are not (or only exceptionally) of organic origin. They are accompanying phenomena of an aromatic anosmia and owe their existence to a psychologically conditioned extension of the smell disturbance to the whole oral sense, which is grounded in the close synaesthesia of the chemical senses.

F. C. SUMNER (Psychol. Abstr.)

On Taste Disturbances in Brain-Injured and the Anosmia-ageusia Syndrome.

Among 300 open brain wound cases (brain shot) in whom an exact investigation of taste sensitivity was undertaken there were found 6 with positive central taste disturbances as follows: 1 bilateral ageusia, 1 bilateral parageusia (bitter monoageusia), 4 hemigeusias. Among 500 closed brain wound cases (contusio cerebri) there were 7 bilateral central taste disturbances. The bilateral ageusias are always bound with anosmia while the unilateral ageusias have no, or only slight, smell disturbances. The author believes, on the basis of neurological and Roentgen findings, that the traumatic ageusia-anosmia is caused by hemorrhages in the wall of the 3rd ventricle and not, as elsewhere assumed, by contusions of the cortical taste centers.

F. C. SUMNER (Psychol. Abstr.)

The Paranoid Schizophrenias.

The author concludes a study of paranoid schizophrenias in actual cases and in the literature with the following observations: (1) that catatonic schizophrenias are about double the frequency of paranoid schizophrenias; (2) that among his paranoids the preponderance of women is considerable (36.3 per cent. men and 63.7 per cent. women) while among his catatonics women were somewhat less numerous than men; (3) that typical, combined and atypical forms are to be distinguished among paranoids as well as among catatonics; (4) that the course in paranoid ailments is preponderantly chronic steadily progressive in 72.6 per cent., with remissions being considerably less than among catatonics; (5) that the age of paranoids (averaging 37.3) is essentially higher than that of catatonics (averaging 25.3); (6) that hereditary taint is, on the whole, weaker in paranoids than in catatonics; (7) that the general diagnosis of "paranoid schizophrenia" was reached with greater positiveness than that of "catatonic schizophrenia."

F. C. SUMNER (Psychol. Abstr.)

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Electric Shock During Pregnancy.

Herewith are added seven cases to the nine already reported by others, in which electric shock treatment alone has been used during pregnancy. The seven patients reported here all received curare to soften the convulsions. One was treated in the first trimester, four in the second and two in the third. In all cases the pregnancy was not complicated by the treatment, and uneventful delivery of normal infants was accomplished at term. On the basis of this experience, and the reports in the literature, it would seem that pregnancy *per se* is not a contraindication to electric shock therapy. From the writers' experience it also appears that curare may be used with safety. (Authors' abstr.)

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Reaction to Stress in Anxiety and Early Schizophrenia.

1. An unselected population of 75 patients was divided into three groups: (A) 36 patients in whom anxiety was the predominant symptom; (B) all other patients, except early schizophrenics ($N = 28$), and (C) 11 early schizophrenics. Eleven normal control subjects were employed in order to provide a base line.

2. A standardized series of pain stimulations were presented by a Hardy-Wolff stimulator. Physiologic recordings were taken continuously throughout the test. Quantitative data obtained from analysis of records were compared with the clinical status of the case.

3. The results and major conclusions may be summarized as follows: (A) in general, severity of anxiety appeared to be related to degree of physiologic disturbance; (B) the clearest correspondence between degree of anxiety and degree of physiologic disturbance under stress was found with measurements reflecting striate muscle activity such as finger movement and neck muscle potentials; (C) in general, the more severe the anxiety, the greater was the over-reaction to pain stimulation; (D) in terms of general level of responsiveness, the early schizophrenic group resembled the most anxious group more than any other. But in two quite different types of reaction, the schizophrenic group showed a relative lack of discrimination among the various intensities. This poor discrimination appeared to reflect (at a simple level) the inappropriateness of response, which is generally typical of schizophrenia. (Authors' abstr.)

Effect of Chronic Fear on the Gastric Secretion of HCl in Dogs.

1. A review of the literature concerned with specific psychological processes involved in the etiology of peptic ulcer revealed a confusing array of contrasting proposals resulting from personality studies of ulcer patients. Of these proposals, that which emphasized the primary role of chronic fear or anxiety appeared to be the best substantiated one.

2. Experimental evidence shows that vagal discharge and associated increased gastric acidity plays a primary role in the physiologic mechanism of ulcer formation.

3. From the foregoing, one would predict a positive relation between chronic fear behaviour and gastric acidity. This prediction was not adequately supported experimentally and it is contradictory to Cannon's hypothesis that increased sympathetic discharge is associated with inhibited parasympathetic discharge in the emotional response of fear.

4. This study was performed to obtain direct experimental evidence relevant to these two hypotheses: (a) during a state of chronic fear behaviour, the acidity of the gastric contents is higher than during normal behaviour; (b) if persistent fear behaviour occurs over an extended period of time, peptic ulcers will develop. It was also desirable to measure gastric emptying rate, heart rate, and behavioural changes under these two conditions of behaviour.

5. A modified conditioning procedure was used to develop a state of chronic fear in 7 dogs. Behavioural observations revealed that 6 of these dogs developed chronic fear behaviour and at the same time showed increased gastric acidity, gastric emptying rate, non-resting heart rate, and increased variability of both non-resting and resting heart rates. The dog who failed to develop chronic fear behaviour was the only exception to this pattern of autonomic changes. Removal of the animals from the experimental environment or omission of the reinforcing pain stimulus resulted in recovery of these behavioural, gastric and cardiac changes. Evidence showed that increased acidity occurs during conditioned fear in the absence of the primary experience of pain. No sexual difference was found in the acid response to the induction of chronic fear.

6. Gross and histologic examination of the stomach and duodenum of each dog showed no signs of tissue pathology in any case.

7. The implication of these results for the problem of ulceration in humans was discussed. In addition, they indicated that the direct extension of Cannon's hypothesis to chronic emotional states, which are of basic importance in psychosomatic disorders, is not justified. (Author's abstr.)

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1. Biochemistry, Pathology, Physiology, etc.

Amylase of Blood and of Cerebrospinal Fluid in Heine-Medin Disease. Callabiano, G. B. [*Riv. pediat. siciliana*, 1, 197-200 (1946).]

In 15 children with poliomyelitis (aged 7 months-4 years) 40-160 and 2.5-10 units of amylase were found, respectively, in blood and cerebrospinal fluid.
C. SCANDURA (Chem. Abstr.)

Fluorescence of Cerebrospinal Fluid of Children with Various Diseases. Cacioppo, Filippo. [*Riv. pediat. siciliana*, 2, 27-8 (1947).]

The study included 19 cases of various non-nervous diseases (I), 90 cases of diseases affecting the nervous system (II), and 68 cases of tubercular meningitis (III). Exposed to Wood's light spinal fluids from (I) and (II) gave no fluorescence, while those from (III) gave a blue fluorescence, even though the disease was in an early stage and other diagnostic means were of no value. Only in 2 cases of blue fluorescence was (III) not confirmed by bacteriological and clinical examination. Cacioppo believes the fluorescence is due to the thiochrome formed by oxidation of aneurine which is much increased during this disease.

C. SCANDURA (Chem. Abstr.)

The Histamine Content of Spinal Fluid with Special Consideration of Dementia Praecox. Trabucchi, Cherubino. [*Riv. patol. nervosa e mentale*, 49, 131-61 (1941).]

Histamine can be determined in spinal fluid without extraction by the method of Barsoum and Gaddum (*C. A.*, 29, 8042¹). The influence of acetylcholine is eliminated with atropine. Adenosine compounds exert on isolated guinea-pig intestine a relaxing effect and callicrein would have no effect at the concentrations employed. Histamine in the spinal fluid of normal persons and of schizophrenics of various types was always less than 0.17 per c.c. Histamine does not seem to play a role in schizophrenic pathology.
A. E. MEYER (Chem. Abstr.)

Amylolytic Power of Blood and of Cerebrospinal Fluid in Children. Callabiano, G. B. [*Riv. pediat. siciliana*, 1, 195-7 (1946).]

Experiments on 20 children showed no relation between the diastasic power of the cerebrospinal fluid and their age. Fluids of babies a few months old contain amylases. There is no relation between amylase content of the blood and of the cerebrospinal fluid. No increase of the diastasic content was found in 3 cases of tubercular meningitis.
C. SCANDURA (Chem. Abstr.)

Cerebrospinal Fluid of Healthy Children After Subarachnoid Injection of Nicotinic Acid. Zangri, G., and Lanza, A. [*Riv. pediat. siciliana*, 1, 330-4 (1946).]

Data are tabulated on the cerebrospinal fluid (including contents of albumin, reducing substances, chlorides, etc.) of 20 children after injection of 20-30 mg. Na nicotinate (I) or 100 mg. nicotinamide (II). The spinal fluid became normal after

4-7 days and 2-3 days after the injection of (I) and (II) respectively. A second injection, 5-8 days after the first, had but little effect on the spinal fluid.

C. SCANDURA (Chem. Abstr.).

Organic Phosphoric Esters in Normal and Pathological Cerebrospinal Fluids. Huszák, István (Tudományegyetemi Agykutató Intézet, Szeged, Hung.). [Orvosok Lapja Népegészségügy, 3, 961-2 (1947).]

No phosphoric acid esters hydrolyzable by acids or alkalies could be detected in cerebrospinal fluid.

ISTVÁN FINÁLY (Chem. Abstr.).

Acetylcholine in the Cerebrospinal Fluid of Mental Patients. Coloma, T. Alcobér (Inst. med. expul., Valencia, Spain). [Trabajos inst. nacl. cienc. med. (Madrid) 3, 359-66 (1943-44).]

Acetylcholine (I) in the cerebrospinal fluid of 32 mental patients was determined by Corsten's method (C. A., 35, 3278^a). No (I) was found in one-third of the cases, most frequently in epilepsy, less frequently in hebephrenia; (I) was always present in catatony. Some samples produced relaxation of lung preparations instead of contraction. Also repetition of the irrigation with the same preparation caused relaxation instead of contraction.

F. FROMM (Chem. Abstr.).

Cholinesterase Activity in Normal and Febrile Rabbit Brain. Peiss, C. N., Field, John, and Hall, Victor E. [Am. J. Physiol., 155, 56-9 (1948).]

Whole homogenate from normal and febrile rabbit brains hydrolyzes, respectively, 9.07 and 8.81 mg. of acetylcholine per 100 mg. fresh tissue per hour. These values are the means of 12 determinations. The difference between these means is not significant. The supernatant fraction of similar homogenates hydrolyzes respectively, 3.52 and 3.51 mg. acetylcholine per 100 mg. fresh tissue per hour (mean of 12 determinations each). The results suggest that quantitative changes in cholinesterase assay are not associated with the thermostatic reset which occurs in fever.

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

Distribution of the Two Fractions of Cholinesterase in Homogenates of Portions of the Dog Brain. Little, J. Maxwell. [Am. J. Physiol., 155, 60-3 (1948); cf. C. A., 43, 297d.]

The Q_{A-Ch} values (mg. of acetylcholine hydrolyzed/100 mg. wet weight/60 minutes) for various portions of the dog brain are as follows: caudate nucleus 33.6, cerebellar cortex 9.7, cerebellar medulla 8.3, cerebellar peduncle 6.4, medulla 5.6, thalamus 5.3, spinal cord 3.6, internal capsule 2.6, white matter 0.93, corpus callosum 0. In general, there is a direct relationship between the estimated relative mass of nerve fiber in the tissue and the activity of the supernatant fluid fraction of cholinesterase. With the exception of the corpus callosum, this relationship is suggestive that the supernatant fluid fraction may be more highly concentrated in the nerve fiber.

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

Vitamin Inhibitors of Cholinesterase. (II) Action of Vitamin K on Serum Cholinesterase In Vitro and In Vivo. Salvi, P., and Chiro, G. Di. [Acta neurol. (Naples), 2, 485-8 (1947).]

Vitamin K inhibits (70.3 per cent. for concentrations of 0.2 per cent.) the cholinesterase of blood serum. The intravenous injection of vitamin K (10 mg.) decreases the cholinesterase content of blood.

(III) Nicotinic Acid and Cholinesterase of Blood Serum In Vitro and In Vivo. Salvi, P.; and Morelli, A. [Ibid., 986-91.]

Nicotinic acid (I) inhibits (29.5 per cent. for concentrations of 0.3 per cent.) the cholinesterase of blood serum. The intravenous injection of 30 mg. (I) decreases the blood content of cholinesterase.

(IV) Bile Salts, Serum Cholinesterase, and Sympathic-Para-Sympathic Equilibrium. [Ibid., 991-7.]

Na taurocholate and Na glycocholate *in vitro* inhibit (76.2 and 46.5 per cent., respectively for concentrations of 0.01 M) serum cholinesterase. Na dehydrocholate (1.2 g. intravenously injected) decreases the cholinesterase content of blood serum.

C. SCANDURA (Chem. Abstr.).

The Concentration of Some Sulfonamide Compounds in the Blood and Spinal Fluid in Infancy. Sartori, Ernesto. [Boll. soc. med.-chir. Pavia, 55, 811-18 (1941).]

Albucid, administered during 24 hours at a total dosage of 0.3 g. per kg., reaches higher concentrations in blood and spinal fluid of infants and in shorter time than is the case with sulfapyridine given in equal amounts. Albucid is eliminated in 8 hours, sulfapyridine in 24.

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

Grigorescu's Reaction for Globulins in the Spinal Fluid. Matilla, V., and Garrido, J. Aparicio. (Inst. med. expil., Madrid). [Trabagos inst. nacl. cienc. med. (Madrid) 2, 257-64 (1943-44).]

The reaction consists in the appearance of turbidity at the surface of contact between 0.5 c.c. of spinal fluid with superimposed 95 per cent. EtOH. The method is equally as sensitive and reliable as other methods. It does not give false positive readings in case of contamination with small quantities of blood.

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

Colloid Reaction Investigations on Spinal Fluid. Szécsey, Gyorgy (Tudományegyetemi II, sz. Belklinika, Budapest, Hungary). [Orvosi Hetilap, 89, 268-72 (1948).]

Samples of cerebrospinal fluid were tested (1) according to Guillain by the benzoin test; (2) by the mastic test proposed by Emanuel, Kafka, Cutting and Stanton; (3) by the paraffin test according to Kafka; and (4) by the shellac test proposed by Urechia-Danetz with the modification that the reagent was prepared according to Marchionini. Investigation of 50 different fluids proved that (1) gave best results and made possible a reliable distinction between meningitis and lues reaction types.

ISTVÁN FINÁLY (Chem. Abstr.).

Ultraviolet Light Absorption of Spinal Fluid Ultrafiltrates from Schizophrenics. Duensing, Friedrich (Univ. Göttingen, Ger.). [Nervenarzt, 18, 277-9 (1947).]

Absorption curves were measured between 240 and 289 m μ in spinal fluid ultrafiltrates from 15 schizophrenics and, as controls, 5 psychopaths. There was considerable variation in the curves and no consistent differences were found, except that the schizophrenic fluids tended to give a smaller absorption. Duensing concludes that abnormal substances, detectable by this method, are not present in the spinal fluid in schizophrenia.

WARREN M. SPERRY (Chem. Abstr.).

Protein Content and Wassermann Reaction in Cerebrospinal Fluid. Rizzo, Cristoforo (Univ. Messina, Italy). [Riv. patol. nervosa e mentale, 68, 49-57 (1947).]

The smallest protein content of cerebrospinal fluid in order that the Wassermann reaction be positive should be 0.0168-0.0170 g. per cent. The maximum normal protein content is 0.0165 g. per cent.

C. SCANDURA (Chem. Abstr.).

Blood Cholesterol Level in Hypophysealencephalitic Conditions. Zondek, H., Leszynsky, H., and Wolfsohn, Gerda. (Biccur-Cholim Hosp., Jerusalem). [Schweiz. med. Wochschr., 78, 746 (1948).]

A high blood cholesterol level is found in disease of the hypophysis (240-460 mg. per cent.) in a great percentage of the cases examined. It is assumed that regulation of the cholesterol level is subject to the status of the hypophysis.

E. MAIER (Chem. Abstr.).

Comparison of Transients in Inorganic Systems With Those in Plant and Nerve Cells. Bartlett, James H. [J. Cellular Comp. Physiol., 32, 1-29 (1948).]

In the Lillie passive iron-wire model of nerve, overshoot of potential does not occur as it does in nerve during the transition from the active to the passive state. Current vs. time curves in *Valonia*, *Halicystis* and *Nitella* have the same qualitative nature as those in electrolytic cells such as FeH₂SO₄H₂(Pt). The inductance discovered in squid nerve is essentially an electric parameter necessary for des-

cribing the overshoot which is attributed to 2 or more coupled reactions. If a nerve surface is regarded as analogous to a "rusty" sieve, subthreshold effects would be governed by leakage of ions through the sieve, and propagation of an impulse would be associated with removal of a closely adhering layer from the sieve itself.
H. L. MASON (Chem. Abstr.)

Action of Some Quaternary Ammonium Derivatives on Neuromuscular Transmission. Huidobro, F. [Bol. soc. biol. Santiago, Chile, 5, 6-10 (1948).]

Choline 1, Girard-P 0.1-1, and Girard-T 0.5 per cent. were tested on cats anesthetized with nembutal. The compounds increased the action of KCl and of acetylcholine, opposed that of curare, and intensified that of prostigmine. Choline was effective in denervated muscles also.
H. L. WILLIAMS (Chem. Abstr.)

Carbamate Conduction Block in Frog Nerve Fibers. Crescitelli, Frederick. [Am. J. Physiol., 155, 82-91 (1948).]

Certain features in the blocking action of ethyl, propyl, butyl and amyl carbamate are described. These esters block selectively the different fibers of the bullfrog sciatic nerve. Evidence for the existence of a period of heightened susceptibility to block by carbamate was noted after the washing out of a previously added carbamate and the complete recovery of ability to conduct.
E. D. WALTER (Chem. Abstr.)

Action of Caffeine and Bromides in Weakened and Well-established Conditional Reflex Polypnea. Popova, T. V. (Fiziol. Zhur. [J. Physiol., 34, 549-54 (1948).]

Administration of 0.1 g. caffeine (in milk) to dogs prolonged a conditioned polypnea from 3-7 minutes to 20 minutes. Administration of NaBr leads to extinction of conditioned reflex action only at 1.5 g. NaBr (9 kg. dog), and the extinction is not stable as a rule. This indicates that the action of bromide is not limited to the respiratory center, but depends on the functional state of cerebral cortex. Caffeine acts as an analeptic and is capable of enhancing the conditional reflex polypnea, weakened by prolonged action of the stimulus.
G. M. KOSOLAPOFF (Chem. Abstr.)

Histidine in the Urine of Mental Patients. Capaccioli, Pietro. [Rass. studi psichiat., 37, 202-8 (1948).]

By the Hinslers and Laszlo method histidine was determined in the urine of normal persons and of patients with common diseases and with mental diseases. Histidine was always present but quantitative differences were not significant.
C. SCANDURA (Chem. Abstr.)

Influence of Insulin-shock Therapy on Protein Metabolism and Elimination of Chlorides in Schizophrenia. Cortesi, Maria C. [Rass. studi psichiat., 35, 79-103 (1946).]

In 11 patients with schizophrenia subjected to insulin-shock therapy for 1, 2 and 4 months and to unchanged diet, the daily urinary elimination of urea was determined by the Kowarsky method, chlorides, by the Strauss method, and in some cases, phosphatides and creatinine were determined. In 66 per cent. of the cases a decrease of the N excretion was noted, in 33 per cent. an increase. Both effects persisted also after the treatment. Chloride elimination was slightly increased in 50 per cent. of the cases and decreased in the others.
C. SCANDURA (Chem. Abstr.)

The Ammonia and Glutamine Content of the Brain. Richter, Derek, and Dawson, Rex M. C. [J. Biol. Chem., 176, 1199-1210 (1948).]

The normal NH_3 (I) content of the rat brain was 0.28 mg. per cent. and the glutamine (II) content was 79 mg. per cent. The (I) level was decreased by prolonged nembutal narcosis and markedly increased by direct stimulation of the brain or by procedures which increased cerebral irritability. The (I) level was increased to 0.47 mg. per cent. by picrotoxin administration and to 0.81 mg. per

cent. by anoxia. Electric stimulation caused a rapid increase in the (I) level in 1-2 sec. and it was also raised by the stimulus of decapitation. The brain (I) was not affected by emotional excitement and the (II) content was not significantly affected by any of the factors which were tested. Injections of NH_4Cl in the rat caused convulsions when the brain (I) had risen to 9 mg. per cent. In conditions such as epilepsy, in which the brain is abnormally irritable, the toxic action of (I) may play a significant part. H. O. S. (Chem. Abstr.).

Detection of Scorbutic and Rachitic Changes in Pigeon by Measurement of Chronaxia. Lecoq, Raoul, Chauchard, Paul, and Mazoué, Henrietta. [Compt. rend., 222, 685-7 (1946).]

Adult pigeons made deficient in either vitamin C or D (by avitaminous diets or diets producing alkalosis), show an increased chronaxia for peripheral nerve followed by a decreased muscle chronaxia. These changes reach a maximum value at which they remain, by the 8th day of avitaminosis. The neuromuscular disturbances produced by alkalosis yield only to vitamin feeding, there is no synthesis of vitamins by the birds. B. A. (Chem. Abstr.).

Chronaximetric Investigation of Anaphylactic Shock. Chauchard, Paul, Mazoué, Henriette, and Lecoq, Raoul. [Compt. rend. soc. biol., 142, 889-90 (1948).]

During non-fatal anaphylactic (horse serum) shock in guinea-pigs and rats the peripheral chronaxia shows first a decrease, then, about 30 minutes after the shock injection, a large increase. Atropine prevents the first phase and antergan prevents the second phase; the 2 drugs together prevent all changes in chronaxia. It seems probable that at first acetylcholine, then later histamine, are involved in the shock reaction. L. E. GILSON (Chem. Abstr.).

Nucleic Acid in Nerve-Cell Regeneration. Bodian, David (Johns Hopkins Univ., Baltimore, Md.). [Symposia Soc. Exptl. Biol. I, Nucleic Acid, 163-78 (1947); cf. C. A., 41, 3855d.]

The cytoplasmic nucleic acid function in normal and regenerating metabolism of nerve cells was examined. Regressive changes in neurons follow disturbances such as those induced by chemical agents, toxins, virus activity, etc. Under some conditions these disturbances may lead to death of the cell. It appears that the Nissl substance (I) (nucleoprotein aggregate) is the most sensitive morphological indicator of regressive changes in that it shows the first changes, which are in the direction of reduction in quantity. Reduction in (I) is apparent within 24 hours after axon section, and the reduction proceeds for a period of one week, during which time the protein structure of (I), and the basophilic component disappear in the central part of the cell body. A decrease in absorption at 2804 Å. reflects these changes. Recovery changes are evident within 2 weeks after section. In chromatolytic cytoplasm a decrease in extinction coefficients occurred at 2652 and 2804 Å., paralleling morphological changes in (I). The nucleo-protein changes in cellular body cytoplasm which occur during regression and regeneration seem to be associated with adjustment of the steady state of the nerve cell to the initial decrease of cell volume and subsequent growth requirements of the regenerating axon. Enzymic changes during chromatolysis indicate that the acid phosphatase activity is doubled during axon regeneration, as compared with normal nerve. Ten to 14 days after sciatic nerve section acid phosphatase activity is 6 times normal, such increase being attributed to the proliferation of Schwann cells. Tests using anterior horn cells reveal an average 40 per cent. decrease of phosphocreatine in regenerating anterior gray when compared to normal gray of the opposite side. The values for inorganic P were high, owing to hydrolysis of acid-hydrolyzable phosphate during the determination. This resulted in low adenosinetriphosphate values which are not considered to be significant. Likewise the difference in inorganic phosphate of normal and regenerating anterior gray is not significant. The decrease encountered in creatine phosphate in regenerating neurons suggests an increased usage of creatine phosphate. It is postulated that the disturbance of molecule arrangements in the complex nucleoprotein aggregate (Nissl body) is an important factor in induced virus resistance in nerve cells. The changes observed towards embryonic levels, with subsequent return to adult levels as

regeneration is completed. Both developing and regenerating neurons have low levels of cytochrome oxidase activity, low levels of cytoplasmic nucleo-protein, high phosphate turnover, and increased demands for protoplasmic synthesis.

JOHN P. CRISPELL (Chem. Abstr.).

Does Glutamic Acid have any Effect on Learning? Stellar, Eliot, and McElroy, Wm. D. (Johns Hopkins Univ., Baltimore, Md.). [Science, 108, 281-3 (1948).]

The maze-learning ability of pigmented rats of the Johns Hopkins colony (descendants of the Lashley strain) was not improved by the feeding of 200 mg. of L(+)-glutamic acid per day. These results do not confirm those of Zimmerman and Ross (C. A., 38, 4688^g) who used albino rats of the Sherman strain, although the same procedures were followed in all other details.

FRED. H. SNYDER (Chem. Abstr.).

Role of Peroxide in Oxidations in Nerve Tissues. Huszák, István (Univ. Szeged, Hung.). [Orvosok Lapja és Népegészségügy, 2, 1245-8 (1946).]

In cats the catalase quotients found were for red corpuscles 6000, liver 2700, kidneys 800, lungs 600, spleen 550, heart muscle 400, gastrocnemius 400, gray substance of brain 60, white substance of brain 40. In cat-brain tissue heavy metal ions catalyzed oxygen absorption. In horse brain fatty acids absorbed no O in presence of heavy metal salts or metal salts and H₂O₂. The fraction containing unsaturated acids could easily be oxidized by heavy-metal ions. H₂O₂ probably forms hydroxy acids, which are easier to oxidize. The low catalase content of brains is tentatively attributed to the fact that nerve tissue contains much unsaturated acid, for the oxidation of which peroxide formed during other biological processes is readily available.

ISTVÁN FINÁLY (Chem. Abstr.).

Wheat Gluten as a Convulsant. Erickson, T. C., Gilson, W. E., Elvehjem, C. A., and Newell, G. W. (Univ. Wisconsin, Madison). [Proc. Assoc. Research Nervous Mental Disease, 26, 164-74 (1947); cf. C. A., 41, 5183g.]

WARREN M. SPERRY (Chem. Abstr.).

An Experiment on Human Vitamin B₆ Deprivation. Hawkins, W. W., and Barsky, James (Univ. Saskatchewan, Can.). [Science, 108, 284-6 (1948).]

An adult male consumed a purified diet, without added pyridoxine, for about 2 months. Albuminuria was observed on the 12th day and persisted during 7 days of pyridoxine feeding (10 mg./day) and for some time on an ordinary diet. An unusual degree of depression and mental confusion, which occurred on the basal diet, disappeared after pyridoxine supplementation. An alteration in the proportions of lymphocytes and neutrophils was corrected by pyridoxine feeding.

FRED. H. SNYDER (Chem. Abstr.).

Effect of Thiamine Deficiency on Western Equine Encephalitis in Mice. Kearney, E. B., Pond, W. L., Plass, B. A., Maddy, K. H., Elvehjem, C. A., and Clark, P. F. (Univ. of Wisconsin, Madison). [J. Infectious Diseases, 82, 177-86 (1948); cf. C. A., 42, 2343h.]

When Swiss mice were inoculated with western equine encephalitis virus after severe signs of thiamine deficiency were evident the majority of 450 animals failed to show characteristic signs of infection. Such mice showed only weakness progressing to atonia, tremors, and difficulty in maintaining balance or in righting themselves. Mice on optimum diet died early. Inoculated thiamine deficient mice died earlier than uninoculated deficient mice. Mice on the deficient diet, when inoculated before the deficiency was marked, showed characteristic signs of infection, as did those receiving 30 or 60 µg. of thiamine per 100 g. of diet. It appears that thiamine deficiency does not prevent multiplication of the western equine encephalitis virus in the brains of mice, nor the production of characteristic brain lesions, but does modify the clinical responses to the virus-induced pathology.

JULIAN H. LEWIS (Chem. Abstr.).

Disturbances of Neuromuscular Excitability During Alimentary Imbalance and Avitaminoses. XX. Relation Between Vitamin Needs and Certain Amino Acids. Lecoq, Raoul, Chauchard, Paul, and Mazoue, Henriette. [Bull. soc. chim. biol., **29**, 705-16 (1947); cf. C. A., **42**, 650d. See C. A., **42**, 2000i.]

XXI. *Action of Vitamin P on the Neuromuscular Symptoms of Scurvy.* [Ibid., 717-23. See C. A., **41**, 4837c.]

XXII. *Lack of Essential Fat Acids (Avitaminosis F) in Rat and Pigeon.* [Ibid., 724-8. See C. A., **42**, 970i.]

XXIII. *Vitamins and Amino Acid Metabolism.* [Ibid., 981-8. See C. A., **42**, 3040i.]

XXIV. *Vitamins and Fat Metabolism.* [Ibid., 989-98.]

In rats, the subcutaneous injection of small amounts of ordinary fats, or the feeding of large amounts in the diet, does not increase any vitamin requirement. The subcutaneous injection of castor oil, or Na stearate, oleate, or linoleate, or the feeding of any one of these in sufficient quantity to produce dietary imbalance, produces a disturbance of neuromuscular chronaxia and an encephalomedullary hyper-excitability which can be prevented or cured by oral administration of either nicotinamide, pantothenic acid, or pyridoxine. L. E. GILSON (Chem. Abstr.).

Effect of Convulsive Activity of Brain upon its Carbohydrate Metabolism. Olsen, Norman S., and Klein, J. Raymond (Univ. Illinois, Chicago). [Proc. Assoc. Research Nervous Mental Disease, **26**, 118-30 (1947); cf. C. A., **41**, 3854f, 3870g, 6977b.] WARREN M. SPERRY (Chem. Abstr.).

Studies of the Relation Between Electrolyte of the Cerebral Cortex and Mechanism of Convulsions. Colfer, Harry F. (Mayo Foundation, Rochester, Minn.). [Proc. Assoc. Research Nervous Mental Disease, **26**, 98-117 (1947); cf. C. A., **41**, 6344g.]

Slices of cerebral cortical tissue from rabbits were incubated for 1 hour in rabbit serum adjusted to a pH of 5.4, 6.6, 7.4, 8.0 or 9.7. The slices were then micro-incinerated and subjected to crystallographic analysis. At pH values below 7.4 there was a large loss of intraneural and a much smaller loss of intercellular electrolyte. At pH values above 7.4 there was a large increase in intracellular electrolyte with no change in the intercellular phase. The changes were reversible. The effect of increased pH was similar in all respects to that produced *in vivo* by induced convulsions. Daily injection of 1 mg. desoxycorticosterone acetate protected rats against convulsions induced by a loud, high-pitched sound and produced changes in the micro-incineration pattern opposite to those caused by induced convulsions. A low-K diet also exerted a protective effect against audiogenic convulsions. WARREN M. SPERRY (Chem. Abstr.).

A Comparison of the Influence of 2,4-Dinitrophenol on the Oxygen Consumption of Rat Brain Slices and Homogenates. Peiss, Clarence Norman, and Field, John (Stanford Univ. School of Med., Calif.). [J. Biol. Chem., **175**, 49-56 (1948).]

The respiration of rat cerebral cortex slices is stimulated by 2,4-dinitrophenol (I) in concentrations between 4.46×10^{-6} and 8.92×10^{-5} M. and depressed by higher concentrations. (I) inhibits O₂ consumption of reinforced brain homogenates (cf. Reiner, C. A., **41**, 5593c), the effect increasing with concentration. The O₂ consumption of untreated homogenate is about equal to the maximum observed in brain slices stimulated by (I). The data support the view that the increase in cell respiration produced by (I) depends on the inhibition of a "brake" or regulating enzyme. FRED. H. SNYDER (Chem. Abstr.).

Effect of Motor and Sympathetic Nerve Impulses on the Adrenaline-dehydroadrenaline System. Utevsii, A. M., and Butom, M. L. (Ukrainian Inst. Exptl. Endocrinol., Kharkov). [Biokhimiya, **13**, 346-50 (1948); cf. C. A., **42**, 3039h.]

Part of the adrenaline found in tissues is in an oxidized quinone form, which can be reduced to adrenaline. The reduction of the oxidized to the active hormone

form can be accomplished by the introduction of ascorbic acid into animals which do not synthesize vitamin C. Nerve impulses are also capable of producing the active hormone from its oxidized form. Thus, the electric stimulation of the sciatic nerve of the gastrocnemius muscle of a frog's leg leads to the complete disappearance of the dehydroadrenaline, with a simultaneous increase of adrenaline. On stimulating the sympathetic fibers, a complete reduction to adrenaline also follows. Furthermore, the adrenaline content is now greater than that of the control, which indicates that some adrenaline was mobilized from other sources, possibly by the liberation from protein-adrenaline complexes.

H. PRIESTLY (Chem. Abstr.).

Physiology of Neuromuscular Junctions; Chemical Aspects. Acheson, Geo. H. (Univ. of Cincinnati, Cincinnati, O.). [*Federation Proc.*, **7**, 447-57 (1948).]

The chemical transmission of nerve impulses at the endplate is discussed.

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

Stimulating Action of Phosphate Compounds on the Perfused Superior Cervical Ganglion of the Cat. Feldberg, W., and Hebb, Catherine (Univ. Cambridge, Eng.). [*J. Physiol. (London)*, **107**, 210-21 (1948).]

Adenosinetriphosphate, creatine phosphate, yeast and muscle adenylic acid and the Na salts of tri-, pyro- and orthophosphoric acids have a powerful stimulating action on the perfused superior cervical ganglion as well as on the denervated ganglion after degeneration of its preganglionic fibers. Creatine and adenosin are without effect. The stimulating effect is abolished by very high concentration of eserine but not by curare. The effect is analogous to that of K and citrate.

H. L. WILLIAMS (Chem. Abstr.).

Some Effects of Nicotine-like Substances and their Relation to Sensory Nerve Endings. Brown, G. L., and Gray, J. A. B. (Natl. Inst. Med. Research, Hampstead, London). [*J. Physiol. (London)*, **107**, 306-17 (1948).]

Dogs and cats anesthetized with nembutal or chloralose and decerebrate cats under ether received arterial injections of nicotine and acetylcholine into the skin or mesentery. Centripetal discharge of impulses in the nerves supplying the injected area was observed. The response was not abolished by atropine nor elicited by acetyl- β -methylcholine or histamine. Large doses of nicotine or acetylcholine after eserine abolished the sensitivity of the preparation to subsequent doses but not to mechanical stimuli.

H. L. WILLIAMS (Chem. Abstr.).

Effect of Diisopropyl Fluorophosphonate on Neuromuscular Transmission in Cats. Brown, G. L., Burns, B. Delisle, and Feldberg, W. (Natl. Inst. Med. Research, Hampstead, London). [*J. Physiol. (London)*, **107**, 346-54 (1948).]

Diisopropyl fluorophosphonate behaves similarly to eserine in decerebrate cats. Arterial injection of 100-200 γ /2-3 k/g. cat causes an increase of tension response of the tibialis anterior to single maximal motor nerve volleys. Intravenously larger doses, 10 mg./kg., are required. The material has a greater affinity for pseudo- than true cholinesterase.

H. L. WILLIAMS (Chem. Abstr.).

Cerebral Concussion and Convulsive Reactivity. Spiegel, E. A., Spiegel-Adolph, M., Wycis, H. T., and Marks, M. (Temple Univ., Philadelphia, Pa.). [*Proc. Assoc. Research Nervous Mental Disease*, **26**, 84-97 (1947).]

Generalized metrazole (I) convulsions were abolished in rats by a concussive blow to the head, and the sensitivity to electrically induced convulsions was usually decreased in rats and cats by concussion. Various biochemical explanations were tested. Atropine in doses able to counteract an effect of acetylcholine did not influence the action of concussion on (I) convulsions. Concussion can occur without change in cerebral lactic acid, phosphocreatine, or adenosinetriphosphate concentrations and without effect on O. uptake of brain tissue *in vitro*. In 37 patients who had sustained a cerebral concussion and in concussed animals the cerebrospinal fluid showed an ultra-violet absorption band with a peak at about 2650 A.,

significantly higher than in normal controls, and not accounted for by blood or an abnormal protein concentration. Enzymes able to split nucleic acid were demonstrated in cerebrospinal fluids from concussed patients and animals.

WARREN M. SPERRY (Chem. Abstr.).

Brain Volume, Diameter of the Blood Vessels in the Pia Mater, and Intracranial Pressure in Acute Carbon Monoxide Poisoning. Sjostrand Torgny (Caroline Hosp., Stockholm, Sweden). [*Acta Physiol. Scand.*, **15**, 351-61 (1948).]

The diameter of the blood vessels in the pia mater increases during absorption of CO, the brain swells, and intracranial pressure rises. This probably explains the headache accompanying CO poisoning.

S. MORGULIS (Chem. Abstr.).

A Historical Note on the Discovery of the Synapses in the Autonomic Nervous System with the Help of Nicotine. Heubner, Wolfgang. [*Arch. exper. Path. Pharmacol.*, **204**, 33-5 (1947); *Chem. Zentr.*, 1947, **1**, 769.]

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

Electrical Activity of the Spinal Cord in Ether and Pentothal Anesthesia. Horsten, G. P. M. (Univ. Amsterdam, Netherlands). [*Arch. intern. pharmacodynamie*, **77**, 212-18 (1948).]

In cats under pentothal, rapid frequencies are superimposed on the slow ones, while under ether the rapid frequencies are much less in evidence. If the cord is cut in the cervical region, the electric activity is the same under ether or pentothal, i.e. both produce a predominance of slow frequencies.

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

Cerebral Blood Flow in Epilepsy. Gibbs, Erna L., Gibbs, Frederic A., Hayne, Robert, and Maxwell, Harry (Univ. Illinois, Chicago). [*Proc. Assoc. Research Nervous Mental Disease*, **26**, 131-40 (1947).]

A method for the determination of cerebral blood flow is described. Inject a 0.2 per cent. solution of Evans blue (I) at a constant and known rate into the carotid artery and determine the concentration of (I) in blood from the jugular vein. Six epileptic patients, during periods between seizures, did not differ from 6 non-epileptic patients in the rate of cerebral blood flow or in arterio-venous differences in O₂ or glucose. The cerebral blood flow may be doubled or halved by breathing a mixture high or low, respectively, in CO₂.

WARREN M. SPERRY (Chem. Abstr.).

Histochemical and Action Potential Studies on Epileptogenic Areas of Cerebral Cortex in Man and the Monkey. Pope, Alfred, Morris, Arthur, A., Jasper, Herbert, Elliott, K. A. C., and Penfield, Wilder (McGill Univ., Montreal, Can.). [*Proc. Assoc. Research Nervous Mental Disease*, **26**, 218-33 (1947).]

Epileptogenic areas were produced in monkey brains by the application of alumina cream (*C. A.*, **36**, 6668⁷; **39**, 1461⁸). Such areas also were obtained at operation from human brains. The interstitial pH was no less in these areas of monkey brains than in normal areas; in some animals there was a slight, variable increase above normal. Indophenol oxidase activity was normal as determined on fresh frozen sections of epileptogenic areas from human brains. Cholinesterase was increased above normal in these areas of both human and monkey brains.

WARREN M. SPERRY (Chem. Abstr.).

Metabolic Studies in Paroxysmal Paralysis. Jantz, Hubert (Univ. Freiburg, Ger.). [*Nervenarzt*, **18**, 360-78 (1947).]

Biochemical studies were carried out during 68 attacks of paralysis in 9 patients with paroxysmal paralysis. Some of the attacks were spontaneous; others were induced by the administration of insulin and glucose or desoxycorticosterone. Without exception a decrease in serum K concentration occurred during the attack, to about 13-15 mg./100 ml. for mild attacks and to 6-8 mg. when the paralysis was severe. With remission the K concentration returned to the normal level of

about 20 mg./100 ml. Great care was taken to avoid hemolysis. Between attacks all of the serum K was ultrafiltrable, but during the paralysis only a portion, sometimes less than half of the reduced amount, was found in the ultrafiltrate. Balance studies showed no increased excretion of K in urine and feces during attacks. The K concentration of muscle, taken by biopsy at the height of a severe attack, was 710 mg./100 g. Another muscle sample, taken from the same patient $\frac{1}{2}$ hour after remission, contained 360 mg./100 g. No changes in the Ca, Na, or Mg concentrations of the serum occurred, but the creatine (I) concentration dropped sharply during attacks, sometimes almost to zero, and the inorganic P concentration also was reduced to approximately 0.5 the normal level. (I) was excreted in the urine in considerable amounts by a male patient during symptom-free periods but the excretion almost ceased during an attack. There was no compensatory increased excretion during the following period. (I) and P concentrations in muscle were unchanged during an attack. Administration of K by mouth, as KCl or other K salts, in doses of 15 to 20 g. KCl, caused a complete remission of the paralysis within 1 to 2 hr. without exception in 57 trials. However, K therapy had no prophylactic action against the paralytic attacks. The results are explained by the hypothesis that a lack of ionized K inhibits the normal cleavage of creatine phosphate in muscle, with a resultant paralysis.

WARREN M. SPERRY (Chem. Abstr.).

Potassium Concentration in Human Gastric Juice with Special Reference to Parasympathetic Stimulation During Insulin Hypoglycemia. A Clinical Study. Saemundsson, Jóhann (Södersjukhuset, Stockholm). [Acta med. scand., 130, Suppl. 208, 139 pp. (1948).]

The gastric juice was obtained from patients by one of the following procedures: before and after histamine stimulation; during insulin coma; before and after histamine followed by insulin stimulation. In the first group the K concentration was 70.0–74.6 mg. per cent. and the average pepsin concentration was 63.2–89 γ /c.c. 1:100. In group II, patients with hyposecretion showed a K concentration of 81.2–84.9 mg. per cent. and of pepsin 27.2–63.6 γ /c.c. 1:100; while patients with various gastro-intestinal diseases had a K concentration of 66.6–78.5 mg. per cent. and of pepsin 55.1–97.9 γ /c.c. 1:100. Statistically, the higher K concentration of patients with hyposecretion as compared to the first group (normal) was significant. The pepsin concentration was lowest in the group with hyposecretion, and in all cases the concentration was increased after histamine stimulation. In persons without definite gastro-intestinal disease the K concentration at the height of secretion after histamine was not affected either by the volume or by the concentration of HCl. In insulin coma the free HCl was, on the average, 73.9 and the pepsin concentration 161.3 γ /c.c. 1:100. The latter was 1.8 times greater than the highest value found after histamine in the normal group and 2.5 times greater than the average concentration during fasting and indicated that the gastric juice secreted during insulin coma was of the vagal type. The K concentration (56.2 mg. per cent.) was significantly lower than the average fasting "normal" value. In the group in which histamine was followed by insulin the fasting K concentration was somewhat lower (67.9 mg. per cent.) than in the "normal" group (73.7 mg. per cent.), but the difference was not significant, while the pepsin concentration was higher (79.2 and 63.2 γ /c.c. 1:100, respectively). In patients with duodenal ulcers the average K concentration increased significantly after histamine stimulation but decreased during insulin hypoglycemia. In patients with gastric ulcers before vagotomy the rise in K concentration after histamine was not significant; during insulin hypoglycemia there was a significant fall in K, but the values were higher than in the case of duodenal ulcers. The K rose to 91.3 mg. per cent. 40 minutes after histamine in gastric ulcer patients, but only to 75.8 mg. per cent. in cases of duodenal ulcer; it fell to 55.8 mg. per cent. 120 minutes after insulin, but only to 47.5 mg. per cent. in cases of duodenal ulcers. Here again comparatively high K values were found jointly with low pepsin values. In cases of duodenal ulcer after vagotomy the average K concentration (56.6 mg. per cent.) was significantly lower than the "normal" fasting concentration and the situation was similar to that in cases of gastric ulcer before vagotomy, the main difference being that after insulin the fall in concentration was less pronounced after vagotomy.

S. MORGULIS (Chem. Abstr.).

2. Pharmacology and Treatment.

Mode of Action of Parpanit on the Nervous Functions of the Normal Animal Organism. Grandjean, E., Fleisch, A., Baud, Ch., and Galetti, Ch. [*Helv. Physiol. Pharmacol. Acta*, 6, C54-5 (1948) (in French).]

In normal human subjects, ingestion of 50-100 mg. of parpanit (1-phenylcyclopentanecarboxylic acid) causes elevation of threshold of patellar reflex, increase in amplitude of balancing movements, elevation of threshold of deep sensation perception, a slight decrease in muscle tone, and no change in tactile sensitivity of the skin. Injected subcutaneously in rabbits (8-40 mg./kg.) it causes a marked decrease in muscle tone without significant change in neuromuscular chronaxia. It appears to act on the receptor organs of deep sensitivity and decrease their excitability.

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

The Effect of Castration on the Action of Some Barbiturates. Cameron, G. R., Cooray, G. H., and De, S. N. [*J. Path. Bact.*, 60, 239-46 (1948).]

Castrated male rats develop a lowered tolerance for quick-acting barbiturates such as pentobarbital-Na, but not for barbital-Na, a slow acting compound. Replacement of one of the missing hormones, testosterone, is followed by improved tolerance. Ageing of normal rats is accompanied by progressive, though not profound, lowering of tolerance. The altered barbiturate response indicates disturbance, probably reversible, of a functional relationship between the sex glands and the liver. It is known that liver inactivates sex hormones, and such hormones may be utilized as adjuvants or co-enzymes in liver detoxification.

JOHN T. MYERS (Chem. Abstr.).

Blood Vessel-Constricting and -Dilating Substances and the Epileptic Fit from Electric Shock. Laura, Luigi. [*Atti reale accad. peloritana*, 47, 823-49 (1946).]

A discussion on the effects of acetylcholine, amyl nitrite, benzedrine and prostigmine on the convulsions produced by electric shock.

C. SCANDURA (Chem. Abstr.).

Anticonvulsants. Toman, James E. P., and Goodman, Louis S. [*Physiol. Rev.*, 28, 409-32 (1948).]

Epileptic seizures are associated with occasional, excessively rapid and uncontrolled local electric discharges in the gray matter. Even small groups of neurones, predisposed by acquired injury or by inherited defect, may be set off by a great variety of circumstances, which by self-propagation can lead to an involvement of the entire brain in a tonic-clonic seizure or to an anatomically limited manifestation.

Anticonvulsant drugs should act upon the non-neural lesion, upon the abnormally altered neurons to prevent their excessive discharge and upon normal neurons to prevent their response to an excessive discharge. These drugs include, in historical order, bromides, phenobarbital, and other barbiturates, various hydantoin derivatives, and 2,4-oxazolidinedione compounds. With the introduction of hydantoinates the study of anticonvulsants has ceased to be a matter of trial and errors. In evaluating these drugs the final test is the clinical finding; convulsive disorders vary radically so far as therapeutic response is concerned, and the mechanisms of anticonvulsant action may also vary. From the clinical point of view, it is not the absolute potency of the drug which determines its usefulness but its therapeutic index, or the ratio between the dosage which causes untoward effects and that which adequately controls the seizures. Most of the compounds having anticonvulsant activity have an hydantoin, barbiturate, or oxazolidine nucleus. A 5-Ph group is important but not critical and may be replaced by a naphthyl ring but not by benzyl or cyclohexyl rings. Optimum activity among 5-phenyl 5 alkyl compounds is found with short alkyls, and are more effective than alkoxy or alkylmercapto homologs. Activity is increased by a reactive group at 4, especially by a carbonyl and by a 2-keto group. N-methylation at position 3 apparently improves the antimetrazol potency of all 3 groups of anticonvulsant compounds.

S. MORGULIS (Chem. Abstr.).

Anticonvulsive Action and Molecular Structure of Some Heterocyclic Pentagonal Compounds. IV. Dimethyldithiohydantoin and its salts. Hazard, René, Cheymol, Jean, and Smarzewska, Klaudia. [*Compt. rend.*, **227**, 736-8 (1948); cf. *C. A.*, **42**, 7443d.]

Dimethyldithiohydantoin shows remarkable anti-epileptic properties. It is prepared from an equimolecular mixture of isopropyl- α -oxynitrile, NH_4HCO_3 , and $(\text{NH}_4)_2\text{SO}_4$, and consists of white crystals, m. 142° , soluble in boiling water, alcohol, ether, cold C_6H_6 , and alkalis. It forms salts with metals and organic bases. The 50 per cent. lethal intravenous dose for mice is 350 mg./kg. Intravenous doses of 15 mg./kg. in rabbits protect them efficaciously against metrazole convulsions, but 50-mg. doses are even better. It is less efficacious in electric shock. All forms of the compound tested (salts of Na, Ca, Sr, Mg, and diethylamine) gave comparable sedative results; the effect lasted more than 2 hours. In dogs, 10 mg. given intravenously produced hypotension and depression; 50 mg. was fatal. When fed by mouth to rats, 0.1 g./-kg./day for 25 days, the thyroid glands increased in size. It has little hypnotic action, so has this advantage over phenobarbital, and it has an experimental cardiovascular action that is not as dangerous as that of diphenylhydantoin. Furthermore, its feeble toxicity allows a larger therapeutic margin. These 3 anti-epileptics act differently, probably because they are localized in different regions of the central nervous system.

DOROTHY A. MEYER (Chem. Abstr.).

Influence of Certain Anticonvulsant Drugs on Audiogenic Spasms in Albino Rats. Cain, Jacques, and Mercier, Jacques. [*Compt. rend. soc. biol.*, **142**, 688-91 (1948).]

The noise-produced convulsive seizures were prevented by injection of phenobarbital (3 mg./kg.) or Na diphenylhydantoin (20 mg./kg.) 30 minutes previously.

Influence of Tridione (Trimethyloxazolidinedione) on Audiogenic Spasms. Mercier, Jacques, and Cain, Jacques. [*Ibid.*, 993-4.]

Subcutaneous injection of 300 mg./kg. gave protection.

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

Cerebral Metabolism in Metrazole Convulsions in the Dog. Gurdjian, E. S., Webster, J. E., and Stone, W. E. (Wayne Univ., Detroit, Mich.). [*Proc. Assoc. Research Nervous Mental Disease*, **26**, 184-204 (1947).]

Previous observations (*C. A.*, **39**, 5309^a) on chemical changes in cerebral tissue during metrazole (I) convulsions in dogs, immobilized by dihydro- β -erythroidine were extended to a longer period of time after (I). The lactic acid (II) concentration increased to a maximum during the first minute after (I) and did not change appreciably during the following 16-minute period of intermittent seizures. The cerebral (II) concentration was not related to that of the blood. The phosphocreatine (III) concentration decreased at the start of a seizure but did not fall further during the following 16-minute period. Adenosine-triphosphate (IV) and glycogen (V) cerebral concentrations, and the ratio of cerebral to blood glucose (VI) concentrations did not change appreciably after (I). The same cerebral chemical changes were obtained in animals which breathed O. mixed with 4.5 to 7.5 per cent. CO_2 during the (I) convulsions. In these experiments the O. tension of cortical tissue was determined by the polarographic method and found to be maintained above the hypoxia level, although there were considerable fluctuations. These results show that the chemical changes are not due to hypoxia. Injection of (I) during severe hypoxia induces only a brief seizure with no change in (IV), (V), or (VI) cerebral concentrations, but with a large increase in (II), representing the combined effects of (I) and hypoxia, and with a decrease in (III) a little greater than in seizures with adequate O.

WARREN M. SPERRY (Chem. Abstr.).

The Effect of Certain Narcotic and Soporiferous Substances on the Chronaxial Excitability of the Vestibular Apparatus of the Rabbit. Hurynowicz, J. (Univ. Torun). [*Acta Biol. Exptl. (Warsaw)*, **14**, 211-20 (1947) (in French).]

The reflexes during narcosis (rolling of the eye, movement of the head, and nystagmus) produced by the administration of chloral hydrate, chloralose, avertine, NaBr, MgSO_4 , medinal, pantopon and scopolamine were observed.

H. H. SZMANT (Chem. Abstr.).

Toxic Effects of O-Tritolyl Phosphate. Scheid, Werner (Hamburg Univ., Ger.). [*Nervenarzt*, 18, 56-66 (1947).]

Widespread poisoning by o-tritolyl phosphate (I) has been observed recently in Germany as the result of human consumption of commercial "torpedo" oil, which usually contains about 10 per cent. of (I). Scheid studied about 100 cases and describes in detail the symptomology and prognosis. In (I) poisoning not only the peripheral motor neurones, but also spinal tracts and centers are damaged. The condition appears to be the same as the so-called "ginger paralysis" (*C. A.*, 24, 4849⁹).

WARREN M. SPERRY (Chem. Abstr.).

Conditions Modifying Convulsions in Animals. Toman, James E. P., and Goodman, Louis S. (Univ. Utah, Salt Lake City). [*Proc. Assoc. Research Nervous Mental Disease*, 26, 141-63 (1947).]

Review of effect of hydration, body temperature and anticonvulsant drugs on seizure-threshold of animals.

WARREN M. SPERRY (Chem. Abstr.).

Studies in New Anticonvulsants. Merritt, H. Houston, and Brenner, Charles (Columbia Univ., New York, N.Y.). [*Proc. Assoc. Research Nervous Mental Disease*, 26, 387-97 (1947).]

Over 700 compounds were tested for activity against electrically induced convulsions in cats. Approximately 10 per cent. showed anticonvulsant activity; of these only a few have been tested in epileptic patients. 5,5-Diphenylhydantoin was the most effective.

WARREN M. SPERRY (Chem. Abstr.).

The Treatment of Epilepsy with Sodium Diphenylenehydantoin. Fabing, Howard D., Gayle, R. Finley, and Hawkins, J. Robert. [*Proc. Assoc. Research Nervous Mental Disease*, 26, 398-403 (1947).]

Na diphenylene-hydantoin is less toxic than dilantin (I) and is about half as effective as (I) against electrically induced convulsions in cats. It was effective in 60 of the 72 epileptic patients in whom it was tried.

WARREN M. SPERRY (Chem. Abstr.).

Salvarsan encephalitis. Winkler, Kurt (Krankenhaus, Berlin-Friedrichshain, Ger.). [*Z. Haut- u. Geschlechtskrankh.*, 1946, 201-4; *Chem. Zentr.*, 1947, 1, 236.]

When properly used, salvarsan not only shows a highly specific action, especially against *Spirochaeta pallida*, but also is seldom toxic. Hypersensitivity to the drug cannot be recognized in advance. The appearance of a headache after injection of the salvarsan is the first symptom of a threatening encephalitis and demands the greatest care.

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

New Ideas on the Mechanism of Narcosis. Velázquez, B. Lorenzo, and Membrado, J. Elio (Inst. méd. expil., Madrid, Spain). [*Trabajos inst. nacl. cienc. méd. (Madrid)*, 3, 271-9 (1943-44).]

F. FROMM (Chem. Abstr.).