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Psychotic Reactions in the Late Recovery Period Following Brain Injury.

In the observation of 500 cases of craniocerebral injury evacuated to an army neurologic center several months after injury, 4 cases of psychosis appeared. These are described in detail.

Two cases may be classified as schizophrenic reactions in which brain injury played a secondary role. At the most, the experience of trauma, brain damage, and resulting state of deficit served as an aggravating factor. Follow-up study revealed neither patient able to pursue steady or gainful occupation.

Two cases may be classified as prolonged, primary traumatic psychotic reactions (confabulatory-amnesic type) in which brain damage appeared to be the outstanding causative factor. Follow-up study revealed that both patients had been able to return to simple, but steady and gainful occupational adjustments despite some intellectual impairment. (Authors' abstr.)

War Crimes: Their Social-Psychological Aspects.

The question may rightly be asked: What should a psychiatrist assigned to the United Nations—if we may anticipate such an event—be looking for in order to find out whether a destructive-aggressive outburst may be expected in any member nation? On the basis of the author's studies in Germany, four signs may be regarded as danger or warning symptoms which might prompt such a psychiatrist of the future to recommend treatment.

The first sign is the prevalence of thinking in destructive rather than in ameliorative terms in dealing with social problems. The ease with which destruction of life is advocated for those considered either socially useless or socially disturbing, instead of educational or ameliorative measures, may be the first danger sign.

A second and probably more basic symptom is the prevalence of fear as a motivating force, both within the social unit and in the relationship of the social unit to the outside world. The author found fear to be one of the most important motivations for those aggressive outbursts which constituted war crimes. The most significant attitude of the nation and the group committing war crimes was that of fear.

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We have learned that fear is one of the strongest emotions human beings are capable of. Fear has greater psychosomatic reverberations than other emotions. In any social setting whenever fear is allowed to become a socially motivating force, aggressive-destructive outbursts are to be expected. Fear generates aggression, and aggression in turn generates anxiety and fear.

Whenever within a society fear becomes a significant socially motivating force in the dealings of individuals with each other and in the reactions of society as a whole, it should be interpreted as a significant danger sign.

The third sign is tied up with the second. It is the restriction or abolition of the rights of the individual within a society. Whenever these rights are curtailed or abrogated there are new inroads of fear within the society. The fact that members of the S.S. were individually right-less, that they could be broken easily from officer's rank to enlisted man's rank, gives additional reality to the motivation of fear in contributing to aggressive criminal behavior by members of the S.S.

The fourth sign is the lack of freedom of information. The destructive-aggressive behavior in Germany was partly nurtured by the carefully spread notion that the new code of universal destructiveness was also accepted by other nations—only in a less " open " manner. This misconception based on misinformation about the outside world which was accomplished in Germany by the exclusion of news sources from the outside is difficult to eradicate even to-day. While members of a free society may freely gather their information to the limits of their natural curiosity, the restriction of access to information by any nation should be regarded as a danger sign of potential aggressive-destructive behavior.

It will be left to future society to see whether nations so diagnosed could be treated—and if necessary even certified, committed and confined. The extent to which we may be able to make such an arrangement, we may be able to prevent wars and destructive revolutionary outbursts within society. (Author's abstr.)

Electroencephalogram in Cases with Cortical Atrophy and Ventricular Dilatation.

(1) In a series of 67 cases with unequivocal pneumoencephalographic evidence of either cortical atrophy or ventricular dilatation, many normal EEGs were found as well as a considerable variety of abnormal electroencephalographic patterns.

(2) Those cases of cortical atrophy or ventricular dilatation having convulsive seizures as part of the clinical picture invariably showed abnormal EEGs. In the majority of such cases the electroencephalographic abnormalities were of a marked degree.

(3) In cases free of convulsive seizures, the electroencephalographic abnormalities were generally of a mild degree, and the incidence of abnormality was similar for cases with ventricular dilatation (44 per cent.) and cortical atrophy (37 per cent.). However, more slow activity was found in cases with ventricular dilatation than in cases with cortical atrophy, and more fast activity in the latter group than in the former.

(4) Asymmetrical electroencephalographic abnormalities were recorded in only 5 individuals, 2 of whom had unequal ventricular enlargement. In these 2 the greater electroencephologrаphic abnormality was on the side of the smaller ventricle. (Authors' abstr.)

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Practical Aspects of Mesantoin Therapy in Epilepsy.

1. Two years' experience with mesantoin shows it to be a highly valuable anticonvulsant drug. It can be used alone in the control of *grand mal*, especially Jacksonian attacks. It may be of some benefit in psychomotor seizures.

2. The authors have found that mesantoin is best combined with dilantin sodium. Dilantin sodium is still perhaps the most effective anticonvulsant remedy and should be the base upon which other drugs are added.

3. The dosage of mesantoin and dilantin sodium must be individualized and adjusted to the need of the patient. May we impress the goal of a limited number of spells, not a reduced number of pills?

4. A common effective dose for adults is dilantin sodium 1 to 3 capsules, and mesantoin 4 to 6 tablets daily. This combination has proved more effective in controlling seizures than any previous single drug or combined drugs which the authors have used.

5. Side actions of mesantoin include drowsiness and skin rash. As a rule patients acquire tolerance to the drowsiness in a period of time. Dexedrine and physical activity tend to free the patients from the somnolence.

6. Effective control of an epileptic requires close and continued observation and treatment. (Authors' abstr.)

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Psychological and Physiological Effects of Intravenous Pervitin.

1. The physiological and psychological effects of i.v. pervitin, sodium amytal and benzedrine were studied in 75 psychiatric cases.

2. Pervitin has cephalotropic and sympathicotropic effects. It is a more potent cephalotropic and less potent sympathicotropic drug than benzedrine.

3. Pervitin produces an emotionally charged free flow of material, which may include painful memories, traumatic experiences, intimate personal phantasies, and delusional ideas. Most patients experience a dramatic relief of tension and feeling of relaxation. Mild depressions are often delayed. The psychologically rich response evoked by pervitin is helpful both diagnostically and therapeutically.

4. The physiological effects of pervitin include evaluation of blood pressure for 24–36 hours, alteration of pulse rate, dryness of the mouth with thirst, loss of appetite, tightness in the chest, increased awareness of the environment and of sensory stimuli, elimination of fatigue, and wakefullness.

The EKG is not significantly altered. The EEG shows no striking change in basic frequency pattern despite pronounced psychophysiological effects. There is a slight decrease in alpha wave output during the stage of tension and hyper-alertness.

5. A comparison of pervitin with sodium amytal and benzedrine reveals the following:

(*a*) In contrast to sodium amytal, pervitin evokes a more spontaneous, richer and more appropriate response. In some cases, when sodium amytal fails to produce a response, pervitin succeeds. With pervitin there is no loss of consciousness or amnesia for the interview. All the material dealt with during the pervitin interview may be recalled, and is available to the patient's consciousness for integration and assimilation.

(*b*) Benzedrine in doses of 20 to 40 mg. produces similar physiological effects as pervitin, but fails to produce the same intense psychological response. The productions with benzedrine lack the depth and personal significance of those with pervitin.

(*c*) Pervitin may counteract the hypnotic effect of amytal, and amytal may calm the over-excitement occasionally induced by pervitin.

(Authors' abstr.)

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Neurocirculatory Asthenia, Anxiety Neurosis or the Effort Syndrome.

1. Terminology concerning this disorder is confused, with no satisfactory distinction between neurocirculatory asthenia, anxiety neurosis, effort syndrome, neurasthenia, psychoneurosis, combat fatigue and other terms.

2. Symptoms are multiple and high in incidence. In contrast, physical signs are few.

3. Studies of muscular work demonstrate short duration of performance in hard work and a defect in aerobic metabolism in all grades of work as evidenced by oxygen consumption and blood lactate concentration. Pulmonary ventilation is abnormal during work, as is ventilatory efficiency.

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4. Ventilation index and awareness of dyspnea are abnormal.

5. The pulse rate for all grades of exercise is abnormally high. The capillaries of finger nail folds are abnormal. The size of the heart, the electrocardiograms and the resting circulatory measurements, including cardiac output, are normal.

6. Quantitative studies of pain and discomfort show abnormal reaction to painful stimuli.

7. Psychologic tests place patients with neurocirculatory asthenia in the " neurosis " category.

8. The incidence of neurocirculatory asthenia is high in mothers, fathers, brothers and sisters of patients with the disorder. If the disorder is hereditary, the data suggest mendelian dominance.

9. The cause, anatomic changes and specific treatment are obscure.

10. The symptoms, onset and exacerbations are influenced, according to patients' biographic reports, by muscular work, emotion-provoking situations, infection or nothing at all. The difficulties in interpreting this type of data are emphasized.

11. A convenient distinction was made on the basis of history alone between acute and chronic neurocirculatory asthenia. In this study " acute " refers to the disease in patients with a convincing history of previous health and ability to do hard work. " Chronic " refers to the disease in patients who had never been able to do hard work or athletics.

12. In all studies in which differences existed between patients and healthy controls, mean values for those with the acute form of the disease fell between those for controls and those for patients with the chronic form.

13. It is emphasized in studies of this disorder, and perhaps in many others, that basal measurements made with the patients resting may not show abnormalities, while measurements made while the patients are under stress may; the stronger the stress the greater the deviation from normal. (Authors' abstr.)

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Injury of the Central Nervous System Resulting from Decompression to Simulated High Altitudes.

During the course of altitude indoctrination of persons undergoing flight training in the Army Air Forces, a small number of neurologic reactions have been observed. The occurrence of these reactions in an altitude chamber provided an ideal opportunity for observing the chain of events which follows a bout of decompression sickness.

Neurologic reactions occurred in two phases—an early, or primary, reaction, appearing during or shortly after a flight, and a delayed, or secondary, reaction, occurring up to twelve hours after descent. Case reports of such reactions are presented.

The primary type of reaction is due to the lodgment of air bubbles within the cerebral vessels. It is possible that vasospasm resulting from the lodgement of the bubble may be an additional factor in the development of symptoms.

The delayed reaction is also vascular in origin and results from a change in permeability of the vascular wall secondary to its occlusion during the flight. On the disappearance of bubbles after descent, the damaged vessels become dilated; the blood is stagnant, and the walls are permeable. Leakage of fluid results in cerebral edema and diffuse disturbance of cerebral function. At autopsy, flattening of the convolutions, a gelatinous exudate and, occasionally, small hemorrhages are noted.

The trauma which leads to the cerebral vascular reaction observed in these patients is an unusual one. However, the mode of reaction of the blood vessels is probably not unusual, and, as has been suggested by Aring, may play a part in the development of symptoms in a number of other diseases of the brain.

(Author's abstr.)

Modification by Curare of Circulatory Changes. Changes during Electrically Induced Convulsions in Man: A Note on D-Tubocurarine.

The administration of curare before induction of convulsive seizures reduces the degree of rise in venous pressure caused by convulsions; changes in the electrocardiograms of curarized patients given electroshock therapy are similar to, but generally less prominent, than those of uncurarized patients. An apparent exception is the frequent occurrence of ventricular premature beats after seizures in curarized patients; this finding is difficult to evaluate, since the patients of the present study were for the most part well advanced in years. It is concluded also that d-tubocurarine has all the effectiveness of "intocostrin" and lacks some of its drawbacks. (Authors' abstr.)

Fall in Plasma Protein Level Associated with Rapid Gain in Weight during Course of Electroshock Therapy.

A transitory decrease in plasma protein level accompanies the gain in weight which ushers in clinical improvement in patients receiving electroshock therapy. The correction of dehydration accounts only in part for this change. The studies suggest the occurrence of a transitory loss of protein from the circulation, and the pattern of change is that which occurs in patients who, after a period of depletion, begin to store tissue protein. (Authors' abstr.)

Reflex Studies in Electroshock Treatments.

1. Plantar areflexia followed electroshock convulsions in 93·8 per cent. of 500 treatments.

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2. In 25·6 per cent. of the 500 treatments a Babinski sign was noted after short, variable intervals of plantar areflexia.

3. *Petit mal* seizures were not followed by any change in the plantar reflex. (Authors' abstr.)

Effect of Optic and Acoustic Stimuli on the Cortex and Hypothalamus Under Conditions of Picrotoxin Convulsions.

The effect of optic and acoustic stimulation on cortical potentials and movements was investigated under the influence of increasing degrees of picrotoxin poisoning. The results were as follows:

With progressing degrees of intoxication, the sensory response elicited in the specific cortical projection areas increased in amplitude and also became repetitive. Moreover, sensory responses similar in quality and quantity appeared in previously non-responding cortical areas (including the suppressor areas) and in the hypothalamus. The motor cortex was not particularly sensitive to picrotoxin discharges, since responses to an acoustic stimulus appeared in non-acoustic projection areas, while they were absent in the motor cortex. Optic or acoustic stimuli may elicit or intensify convulsive movements, but these reactions were mostly confined to the moment of stimulation. Generalized convulsive movements were not induced with these stimuli. (Authors' abstr.)

Follow-up Study of Men with Penetrating Injury to the Brain.

One hundred men with penetrating damage to the brain were followed for more than six months after discharge from an Army hospital (one or two years after injury). Sixty were found formally employed or attending school.

Twenty-eight had required further medical care for symptoms referable to craniocerebral injury. Only 4 were institutionalized for continued care in veterans' hospitals.

Paralysis, hemianopsia, sensory loss and even residual "aphasic" signs were of less concern to the patient than were disturbances of consciousness, headache and emotional reactions.

Sixty-two men showed significant and continued improvement. Headaches were commoner among those who had them while hospitalized and those with less severe damage to the brain.

At the time of follow-up study, 34 men had had at least one convulsive seizure. The onset of such seizures was usually between the fourth and the ninth month after the wound was received.

Extent of disability is determined by the severity and location of intracranial damage and by the multiple social and personality factors borne by the patient who experienced the injury. (Author's abstr.)

Sleep-Electroshock Therapy of the Psychoses.

Sleep-electroshock therapy is a modification of the orthodox electroshock treatment in which the patient is induced to sleep by the intravenous injection of "sodium pentothal" prior to the application of the electric current. By this means patients who would themselves have discontinued shock therapy because of fear and patients who, because of their unmanageable psychomotor reactions, would have to be denied treatment by the physician, have been treated successfully.

No complications have been observed in the course of over five hundred treatments. On the contrary, by the careful gaging of the depth of anesthesia, one may selectively evoke minor, medium or major reactions. (Author's abstr.)

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Lumbar Puncture Headache.

(1) In 11 subjects with lumbar-puncture headache, pain often spread to the back of the neck and even into the trunk. Neck rigidity was common.

(2) Cerebrospinal fluid pressure in the horizontal posture was observed to be about atmospheric in 6 cases and within the lower limit of normal in 1. In all these 7 cases injection of 30 to 50 c.c. saline, sufficient to restore the pressure to the normal or upper normal range, abolished the headache.

(3) Headache was invariably increased by sitting up and relieved by lying down. It was usually increased by compression of the jugular veins in the neck, and by shaking the head. Not infrequently the headache throbbed with the pulse and in about half the cases was relieved by compression of the carotid artery in the neck.

(4) Lumbar-puncture headache is ascribed to caudal displacement of the base and posterior parts of the brain with tension on the anchoring structures, particularly the tissues around the large arteries at the base. (Author's abstr.)

Projection of the Centromedian Nucleus of the Human Thalamus.

From a histological study of five human cases with lesions in the basal ganglia evidence is educed that the centromedian nucleus of the thalamus projects to the striatum and not to the globus pallidus. (Author's abstr.)

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A case of involutional psychosis with marked obsessions, surgically treated by prefrontal lobotomy, has been reported. The death of this patient from coronary thrombosis five months post-operatively provided an excellent opportunity for pathological studies following the surgical procedure. From these studies there seems to be considerable evidence that atrophy of the nucleus medialis dorsalis of the thalamus followed the operation. This supports the theory that section of the fibers between the thalamus and the frontal lobes prevents emotional reaction to delusional or obsessional ideas. (Author's abstr.)

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Effects of Supranormal Glutamic Acid on Maze Learning.

In an experiment designed to test the reported special influence of glutamic acid in mental functions, 125 growing white rats were divided into three groups and for a total of six weeks were given daily dietary supplements of glutamic acid, glycine, or distilled water. No statistically significant differences, either in original water maze learning or in re-learning, were found between any of the groups. These results are interpreted as failing to confirm, under the experimental conditions of this study, the earlier reported improvement in white rat learning performance following supranormal ingestion of glutamic acid. Two possible explanations of the discrepancy in results are discussed, but direct experimental evidence in support of either is lacking. It is suggested that further investigations be made and reported to test the mental effects of this dietary factor.

(Author's abstr.)

The Development of Conditioned Responses in Cats After Unilateral Decortication.

1. Twelve normal and 12 unilaterally decorticate cats were studied in a shock-avoidance conditioned response situation. The conditioned stimulus was auditory and a flexion of either of the pair of legs being studied resulted in the avoidance of the unconditioned stimulus.

2. In the case of the unilaterally decorticate cats:

(*a*) The conditioned responses were almost invariably flexions of the stimulated leg when the unconditioned stimulus was applied to the foot contralateral to the intact cortex.

(*b*) The conditioned responses tended to be flexions of the unshocked leg when the unconditioned stimulus was applied to the foot ipsilateral to the intact cortex. This tendency was less marked if the cat had previously been trained in a situation involving a response of the diagonally opposite leg.

(*c*) There was no significant difference between the rates of learning under either of the conditions described under 2 (*a*) and (*b*).

3. In the case of the normal cats it was found that:

(*a*) The conditioned response tended to be flexion of the shocked leg.

(*b*) The number of conditioned responses involving the unshocked leg (unshocked leg and both leg conditioned responses) was significantly greater than those given by the unilaterally decorticate cats trained with the unconditioned stimulus applied to the foot contralateral to the intact cortex. (Author's abstr.)

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The Effects of Tridione on Audiogenic Fits in Albino Rats.

Two experiments were designed to test the effect of Tridione in normal and excessive doses on the incidence of running fits induced by auditory stimulation in domestic albino rats. Two groups of animals, totalling sixteen subjects, were tested under auditory stimulation to determine their susceptibility to sound induced convulsions. The rats used as subjects all showed running type fits when stimulated with an electric bell. Experimental animals were injected intraperitoneally with varying amounts of a 1 per cent. Tridione solution; controls with similar amounts of distilled water. Subsequently, animals were retested under auditory stimulation to determine the effect of such treatment on the incidence of audiogenic seizures.

Animals given normal (based on average human dosage) doses of Tridione were not visibly affected by the drug so far as incidence of audiogenic seizures was concerned. Rats given large doses of the drug showed a decrease in percentage of audiogenic fits. Tridione does not have a uniform effect on all animals; individual differences relative to the incidence of seizures following drug treatment were present.

None of the control animals, given intraperitoneal injections of distilled water, showed any marked changes in susceptibility to the sound-induced convulsions. It was concluded that Tridione, when used in large amounts, is effective in alleviating running seizures induced in albino rats by auditory stimulation. No conclusive statement could be made regarding the relation of running fits in rats to psychomotor or *petit mal* epilepsy in humans. (Authors' abstr.)

Maze Learning as a Function of Added Thiamine.

A group of 30 young white rats was given daily dietary supplements of 100 micrograms of thiamine (vitamin B_1), for purposes of comparison with a control group of 33 rats given only distilled water. After four weeks of daily stomach feeding of the supplements, with stock feed and water available at all times, the thiamine-supplemented animals failed to excel the controls in the learning of a 14-unit T-water Maze. Similar negative results were found on a relearning test after an additional two weeks of dietary supplementation. The data are interpreted as demonstrating the ineffectiveness, so far as psychological improvement is concerned, of adding large amounts of thiamine to the normal stock diet of the laboratory rat, in a manner similar to that reported by Harrell to have resulted in significantly greater psychological efficiency in children. They are interpreted as extending the essentially negative results of earlier studies on identical twins by Robertson *et al.*, and on rats at lower levels of thiamine intake by Lush. Possible reasons for the discrepancy in results are discussed, and the positive results of the Harrell study are suggested to be an artefact of increased motivation, developed by the experimental conditions under which increased appetite was not followed by increased food intake, rather than of any specifically improved learning ability. Evidence for this reinterpretation of the Harrell data is presented by means of a detailed comparison of the methodology of the Harrell and Robertson experiments. It is concluded that while no unequivocal demonstration of a genuine facilitation of learning from added thiamine has been made, the implications of the problem are so great as to justify further controlled experimentation.

(Author's abstr.)

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Hypnotic Neuroses: Hypochondriasis and Depression.

An attempt was made to satisfy Koch's third postulate in the field of clinical psychology. A group of 15 college students took the MMPI in four ways: Normal and in three different hypnotic states. The hypnotic states were hypochondriasis, depression, and a third control state called inverted depression in which the depression instructions were repeated in antonym.

The attempt to induce hypochondriasis as a so-called " pure " neurosis failed to obtain in pure form, but yielded scores that were essentially the same as those of clinical cases diagnosed as hypochondriasis. The results of the attempt to induce depression were satisfactory with the exception of the behaviour of the F, the Pd and possibly the K scores.

The evidence indicates that the hypnotic neurosis is neither a simulated state nor a test-taking attitude.

It is felt that Koch's third postulate was satisfied in the case of the induction of hypnotic hypochondriasis, and that it was partially satisfied in the case of hypnotic depression. (Author's abstr.)

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Experimentally Induced Convulsive Reactions of Laboratory Rats. II. A Comparative Study of Post-convulsive Maze Behaviour.

For the experiments involving the use of a running food-reward T-maze, the observational facts may be detailed as follows:

(1) The change in the rat's maze behavior produced by 30 periods of exposure

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to three minutes of noise-fright stimulation with an average daily incidence in the experimental animals of 62 per cent. typical abnormal hyperkinetic, cataleptic or convulsive reactions is reflected in an increase in time spent in the maze during at least the first five trials of relearning on the 20th day after the last of 30 daily experimentally induced noise-fright reactions.

(2) There was no experimental evidence suggesting that the retention of the maze habits, insofar as error scores were concerned, was disturbed any more demonstrably than in control animals which had no noise-fright experience.

(3) The general maze behavior of the NF rats was characterized by evidence of hypervigilance and easily frightened behavior which disappeared, at least to gross observation, after a few trials in relearning the maze.

(4) The change in the rat's maze behavior produced by 30 daily electroshock convulsions is reflected in an increase, relative to control animals, of time spent in the maze during the first 5 to 10 trials of relearning on the 20th day after the last electroshock convulsion.

(5) The animals subjected to the electroshock convulsive experience showed an error of performance in relearning which was not significantly different from the error performance of the first trials of the original learning.

(6) The general maze behavior of rats following 30 consecutive daily electroshock convulsions was characterized by easily startled and frightened behavior which progressively diminished in intensity as relearning proceeded.

(7) Electroshock convulsions produced more complete and more rapidly manifest avoidance reactions and evidence of fear in the experimental animals than did similar numbers of noise-induced abnormal reactions.

For the experiments involving the use of a swimming water-maze, the following conclusions are supported by the experimental data :

(8) There was no evidence for assuming any significant difference in the initial rate of learning between the group of animals susceptible to noise-induced behavior disturbance and the rats selected for the ES group which were not easily susceptible to noise-induced behavior disorders.

(9) Electrically induced generalized convulsions produce changes in the rat's behavior which result in relatively long-lasting post-convulsive reactivation of choice-point errors in an already perfectly learned maze.

(10) After there is evidence of spontaneous recovery from the immediate effects of both electroshock convulsions and noise-fright reactions, the error occurrence in the maze performance of the rats in which electrically induced convulsions have been produced is significantly greater than the error frequency in the maze swimming of rats which have been subjected to noise-evoked behavior disturbances.

(11) The maze errors made by the noise-disordered rats in the three-trial post-recovery period became progressively less as the experimentation continued. A progressive betterment of time scores was related to the observed decrease in errors. This post-recovery betterment of time and error scores did not occur for the electroshock group. In other words, the NF animals appeared to " adapt " to the post-recovery maze experience.

(12) Continued experience with the experimental procedures of electroshock and noise-fright stimulation resulted in decreased swimming time in the maze in the daily single trial before the experimental reactions were induced, when the animals were free from any immediate or post-recovery effects of electroshock convulsions or of noise-fright reactions.

(13) Rats which undergo electroshock convulsions of a generalized nature remain in the maze for a much shorter time in the immediate post-convulsive trials than do animals which have been subjected to electrically induced " catatonic " reactions or to noise-induced abnormal behavior reactions.

(14) Rats subjected to electrically induced " catatonic " reactions observationally like typical noise-fright responses spent significantly less time in the maze in the immediate post-reaction trials than did animals in which the typical abnormal behavior pattern was produced by noise-fright stimulation. These observations confirm the findings previously reported in that the noise-fright induced abnormal reactions resulted in a longer lasting post-attack catalepsy and generalized inhibition than that seen after electrically induced noise-fright-pattern responses or than that observed after generalized electroshock convulsions.

(15) When rats which usually reacted to noise-fright stimulation with the typical acute behavior disorder occasionally displayed no such reaction when subjected

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to the noise-fright situation, their post-stimulation maze swimming approached the limits of optimal speed possible for the maze. The noise-fright stimulation, when it did not result in the motor expression of the abnormal behavior pattern, nevertheless produced an effect on immediate maze behavior by increasing the speed of swimming out of the maze. In terms of motivation, the noise-fright experience apparently enforced the ordinary escape-motivation engendered by the maze. This further supports the hypothesis that the noise-induced behavior disturbance of the rat represents a prototype acute disorganization of behavior as a reaction to fright.

(16) From the standpoint of maze behavior, noise-induced reactions in which running only occurs result in as long lasting absence of locomotor swimming in the presence of the continuing escape-motivation as the catalepsy and inhibition seen after the more typical abnormal behavior pattern ending in a hyperkinetic convulsive phase after the period of initial running. This is additional evidence that the psychological factors determining the abnormal noise-induced behavior disturbance are at least as significant as the neurophysiologic determinants.

(17) Rats subjected to noise-induced abnormal behavior disturbances manifested a significant tendency to move from the start-box upon being placed in the maze immediately following the acute phase of the reactions, although these animals spent a much longer total time in the maze during this period than did animals subjected to electroshock convulsions. Some of the noise-fright rats moved immediately out of the start-box, even though they swam with great difficulty. The general behavior of the electroshocked rats was to wait in the start-box until they recovered their ability to swim and then to swim through the maze without stopping until they reached the exit-platform.

(18) The electroshocked rats had to swim actively for a significantly longer time to reach the goal-exit after locomotion was begun than did animals subjected to noise-induced reactions. The electroshocked rats apparently suffered a temporary cognitive disturbance as one of the results of the electroshock convulsion, which severely affected maze performance for a varying time. This disturbance resulted in the rat's failure to make correct choice-point discriminations, and the swimming time spent in reaching the goal was accordingly lengthened.

(19) The demonstration of a much shorter active swimming time in the maze after noise-induced reactions coexisting with a significantly greater total time, active and inactive, as compared to the electroshock animals, indicates that the initial movement by the noise-fright rats out of the start-box is not, probably, a part of the goal-seeking active swimming behavior, but is another kind of motivational activity specifically related to the start-box situation, probably a carrying-over to the maze-situation of the escape-tendency developed in the noise-fright experience.

(20) The generally last-learned choice-point discrimination in the maze learning process was the choice-point at which the electroshock rats made the majority of errors in maze trials occurring in the recovery period after generalized convulsions. The electroshock convulsions, therefore, affected last-learned responses more than first-learned choice-point discrimination.

(21) The generally last-learned choice-point discrimination in the maze in the original learning process was the choice-point at which the noise-fright rats made the majority of their VTE movements in maze trials occurring in the recovery period after typical noise-fright reactions. Discrimination behavior at the last-learned choice-point was more disturbed by the noise-fright experience than the discrimination behavior at the first-learned choice point.

(22) Although electroshock convulsions produce severe maze performance dysfunction in the rat, there is significant evidence of the retention of the general characteristics of the maze experience even during the initial post-convulsive trials when the severe performance dysfunction is most manifest. The disturbance produced in the rat's behavior by electroshock convulsions affects immediately the choice-point discrimination performance, while the more general orientative behavior, such as the forward-going tendency, and the inhibition of futile, exploratory diving is not manifestly disturbed.

(23) Rats which had no previous experience with the maze and which had never been in water made more errors and took significantly longer to swim the maze to the escape platform after an electroshock convulsion than unshocked control animals in their first experience with the maze.

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(24) No differential error or time effects existed between the two experimental groups of electroshocked and noise-frightened animals in their maze performance 30 days after their experience either with 10 daily noise-fright exposures or with 10 daily electroshock convulsions.

(25) In terms of error or time scores, no significant effects of the experimental experience on maze performance was observed in either the electroshock or noise-fright group of animals 30 days after the last electroshock convulsion or noise-fright reaction.

(26) The effects of 10 electroshock convulsions massed into a five-hour period are not reflected in error or time scores in the maze performance of rats in an already learned maze at 24 hours after the last convulsion. On the other hand, the effects of such a convulsive experience in increased swimming time and the occurrence of errors is manifest for at least two hours afterwards. Accordingly, it follows that electroshock convulsions must be considered to produce a transitory cognitive dysfunction in the rat and not to produce any actual trace-loss of recently acquired maze-learning. (Author's abstr.)

Incidence of Colour-blindness among Psychotic Subjects.

The incidence of colour-blindness among the psychotic patients tested by the authors is not significantly higher than among the normal population.

In their opinion the contrary finding by Kaplan and Lynch was in major part due (*a*) to poor selection of the colour-blindness test used in their study; (*b*) to ignorance of the many random errors which non-psychotic subjects whose colour vision is normal make on this test; and (*c*) to inadequate criteria on which to diagnose the presence of defective colour vision. Lack of control of conditions under which the test was administered may also have been a contributing factor. (Authors' abstr.)

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Tetra-ethyl Ammonium Chloride as an Adjunct in Treatment of Psychovisceral Manifestations of Anxiety.

Tetra-ethyl ammonium chloride is relatively harmless, inexpensive and easy to administer. It produces a complete, though temporary and reversible, block of all autonomic ganglia. It is an excellent tool in the study of the functions and dysfunctions of the autonomic nervous system. It can be administered satisfactorily to ambulatory patients. The intramuscular route is preferable in most instances.

Observations were made on the clinical effects of tetra-ethyl ammonium in 48 patients having varying types of neuroses. The effect of the drug on patients with a pure anxiety state is fairly uniform, predictable and beneficial. The effect on patients with a conversion neurosis or psychasthenia is unpredictable and varied. In general, tetra-ethyl ammonium chloride serves as a useful symptomatic device in weakening at least one of the links in the psychovisceral complex responsible for some of the subjective and objective discomforts in patients with anxiety neuroses. (Authors' abstr.)

Autonomic Nervous System Changes Following Electric Shock Treatment.

(1) Individuals vary in their autonomic patterns. Seven patterns are described. Eighty per cent. of the controls fall into two autonomic groups that contain only 20 per cent. of the mentally ill. These patterns can be altered by electric shock. (However, these changes are not specific for electric shock, as they can be altered by other modes of therapy and by spontaneous changes in the patient's psychological picture.) The question of cause will immediately come to the mind of many.

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With that question we are not concerned in this paper except to state that the psychological and the physiological seem to be parts of the same process. When the psychological picture changes, the physiological picture changes and *vice versa*. They seem to fit as a " hand into a glove."

(2) The autonomic patterns are not specific for any diagnostic category. However, from an analysis of the data it would seem that there is some affinity of certain diagnostic categories for particular autonomic groups, i.e., the distribution is not random. For example, Group IV is mainly neurotics, Group V, schizophrenics and Group VI agitated depressions. There is a possibility that this reflects the selectivity of the cases.

(3) There are definite autonomic changes with electric shock, i.e. provided the clinical picture changes. These are :

(*a*) Increased reaction to epinephrine.
(*b*) Decreased reaction to mecholyl.
(*c*) Decreased basal blood pressure.
(*d*) Changed blood pressure grouping.

We believe that the overall effect of electric shock treatment is to lower the basal sympathetic tension, especially if it has been increased by the illness, and at the same time increase the reactivity of the sympathetic nervous system to stimulation. Decreased reaction of the parasympathetic nervous system to stimulation is often a corollary.

If an anxiety component is present in terms of the authors' test, the following are the likely changes following electric shock treatment :

(*a*) Anxiety precipitated by epinephrine is increased.
(*b*) Anxiety precipitated by mecholyl is relieved.
(*c*) Anxiety temporarily relaxed by mecholyl presages a good result with electric shock.
(*d*) A chill after mecholyl is abolished.

From their studies they can predict that a good outcome with electric shock treatment may occur in cases that show some of the following features :

(*a*) Initial autonomic grouping VI or VII.
(*b*) Anxiety precipitated or relaxed by mecholyl.
(*c*) A chill after mecholyl.

(5) A word of caution : The cases that were shown as examples were the most typical in order to give a clear impression. In many cases there is a combination of factors, for example, a person may fall into a " shock-sensitive " group and have anxiety of the type precipitated by epinephrine. Judging from the autonomic grouping, we might predict a good outcome ; on the other hand, epinephrine precipitable anxiety usually suggests a poor outcome. Much more experience is necessary in order to predict the changes in such complex cases.

(Authors' abstr.)

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Psychological Effects in Depressive Patients of Synhexyl.

The effects of synhexyl, a homologue of one of the active principles of marihuana, have been investigated in a group of patients with predominantly depressive characteristics. The symptoms produced were those of general impairment of

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cerebral function and mild clouding of consciousness. No evidence that the drug is valuable as a treatment for depression was obtained. The symptoms produced were in contrast to those of benzedrine in the same group of subjects. These findings are discussed in relation to the mechanism of action of the drug.

(Author's abstr.)

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Inhibitory Action on a Motor Nucleus and Focal Potentials Generated Therein.

Focal potentials have been recorded in the quadriceps motor nucleus in response to inhibitory volleys in homogeneous groups of afferent fibres. Inhibitory volleys in the *large* proprioceptive afferent fibres of hamstring and of gastrocnemius nerves are thus shown to be transmitted directly into the proximity of the quadriceps nucleus. There they set up positive focal potentials, which, when uncomplicated by interneuronal after-discharges, resemble inverted synaptic potentials, i.e. synaptic potentials recorded when the needle electrode is closer to the " source " of the axon than to the " sink " of the soma and dendrites. Such positive potentials have a time course similar to the simplest form of inhibitory effect exerted on the quadriceps nucleus, the unitary inhibitory curve of Lloyd. Hence it may be concluded that the observations conform with the Golgi-cell hypothesis of inhibi-

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tion, which postulates that such " direct " inhibition exerted by the large proprioceptors is mediated by the subliminal activation of Golgi cells, whose axons produce anelectrotonic foci on the motoneurones by virtue of the current flow so engendered.

On the other hand, the focal potentials show that cutaneous afferent volleys terminate much more distantly from the quadriceps nucleus, and the positive focal potential which they set up in that nucleus is not directly relatable to their inhibitory effect either in time course or intensity. All observations confirm with the explanation that initially the positive focal potential is generated at the synaptic relay in the dorsal horn and that impulses discharged from there may then either " directly " or after further synaptic relay exert an action on the quadriceps nucleus comparable with that " directly " exerted by hamstring or gastrocnemius impulses through the Golgi-cell mechanism.

However, much further investigation is required for the rigorous testing of these explanations. Furthermore, the tests that the authors have made on the postulated explanation of the secondary facilitation (Lloyd) have given equivocal results. (Authors' abstr.)

Synaptic Potentials of Inhibited Motoneurones.

According to the Golgi-cell hypothesis of inhibition, the spread and fusion of the local responses set up by synaptic excitation of a neurone are limited by anelectrotonic foci generated by current flow in activated Golgi cells. Thus it would be predicted that, during concurrent inhibition of motoneurones, there would be a depression only of that part of the synaptic potential which is attributable to the phase of spread and fusion of local responses. Experimental observations with both focal and ventral root recording of synpatic potentials have conformed with this prediction, for, as a rule, an inhibitory depression of the synaptic potential becomes first observable only when the upward inflection of the synaptic potential signals the rapid growth and fusion of the local responses to form a propagated impulse. This mechanism of inhibitory action has been demonstrated for both " direct " and " secondary " inhibition.

In addition, two modes of inhibitory action by blockage of the incoming excitatory volley have been observed when the inhibitory volley is large—as, for example, when it is set up in an adjacent dorsal root. As is well known, (i) the dorsal root reflex discharge may cause a partial blockage by collision, but there may be, apart from such action, (ii) a blockage in the butable to the low safety factor for propagation in this region together with the catelectrotonic depressant action of the dorsal root potential. (Authors' abstr.)

Inhibition of Antidromic Responses of Motoneurones.

An afferent volley in a muscular or cutaneous nerve that inhibits the reflex response of a motoneurone may also cause blockage of antidromic propagation from the axon into the soma, but three dissimilarities show that these two inhibitory actions are not identical (i) the latent period of the antidromic depression is longer by 0·5 to 1·5 msec. (confirming Renshaw) ; (ii) no antidromic depression has been observed to be associated with the " direct " inhibitory action of group I muscle proprioceptor impulses, and even with the " secondary " inhibitory action exerted by impulses in smaller afferent fibres, the reflex inhibition may be total, while the antidromic inhibition is slight or negligible ; (iii) it has been shown that deep anaesthesia may abolish the inhibition of antidromic propagation, while the monosynaptic facilitatory action is much less affected.

Comparable observations have been made with that group of quadriceps motoneurones into which an antidromic impulse can enter only when it is facilitated by a preceding excitatory volley from quadriceps proprioceptors. A preceding inhibitory volley likewise may block antidromic transmission into such facilitated motoneurones, but again there are the above three dissimilarities between such inhibition and reflex inhibition.

Since the facilitation of the antidromic soma spike of quadriceps motoneurones by a volley in group I quadriceps proprioceptors follows the time course of the synaptic potential, such a facilitation curve has been used as a test of the action of an inhibitory volley on the synaptic potential. In conformance with the directly

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observed synaptic potential in the previous paper, inhibitory depression is first observed late on the rising phase or at the summit of the synaptic potential, and thereafter increases during the early part of the decay, which is consequently expedited. Similarly, this inhibitory effect is associated with " direct " as well as " secondary " inhibitory action.

The mechanism of antidromic propagation into a motoneurone is discussed, and it is shown that the Golgi-cell hypothesis of inhibition offers plausible explanations of the above three dissimilarities between reflex and antidromic inhibition.

Finally, it is shown that the experimental investigations of the present paper and the two preceding may be satisfactorily explained in terms of the Golgi-cell hypothesis, whereas other hypotheses fail in important respects. and probably the other postulated mechanisms are of little significance in normal reflex co-ordination. (Authors' abstr.)

Anatomical Considerations of Monosynaptic Reflex Arcs.

The occurrence of monosynaptic reflex arcs in the central nervous system was investigated by the " bouton degeneration method." The results furnish direct anatomical evidence for facts long ago postulated by physiologists :

1. The monosynaptic path of stretch reflexes.
2. The stretch afferent function of neuromuscular spindles.
3. The absence of other kinds of two-neuron reflexes in the central nervous system, even in other kinds of proprioceptive muscular reflexes.

Morphological evidence of the existence of direct inhibitory collaterals from stretch afferents to motoneurons of the respective antagonists has been found.

It has been shown that there is no direct (monosynaptic) connection between primary sensory and preganglionic vegetative neurons. (Author's abstr.)

Analysis of Forelimb-Hindlimb Reflex Activity in Acutely Decapitate Cats.

Stimulation by single shocks of forelimb nerves evokes a variety of reflex effects in the ipsilateral hindlimb motor nuclei of the acutely decapitate preparation. The dominant excitor reflex is one of extension rather evenly distributed over the extensor musculature of the hindlimb.

A " concealed " type of excitor reflex concerns the hindlimb flexors. It is detectable in the decapitate preparation only by exploring with monosynaptic test reflexes the excitability of motor nuclei. This reflex is concentrated at the knee, rather than at ankle or digits.

Another reflex disclosed may be called the inhibitory reflex of flexor longus digitorum. The particular function of flexor longus is claw protrusion. Operation of the reflex in quadripedal progression would have the effect of removing claw protrusion from obligatory association with the extensor phase of the reflex step.

Under the experimental conditions the foregoing reflex effects exhibit no sign of reciprocal action on antagonists.

Concerning afferent pathways the following conclusions may be drawn :

1. Deep and cutaneous nerves of the forelimb on stimulation yield the same reflex result.
2. Group I (myotatic reflex) afferent fibers do not have demonstrable long spinal reflex function.
3. A rather narrow band of the myelinated fiber spectrum, encompassing the lowest threshold cutaneous fibers (? alpha) and the lowest threshold Group II muscle afferent fibers is afferent for the inhibitory reflex of flexor longus digitorum.
4. Fibers afferent for the excitor reflexes lie among the higher threshold bands, including Group III-delta fibers.
5. Receptive field for the inhibitory reflex of flexor longus digitorum is limited to the extreme distal end of the forelimb.
6. Nerves from all parts of the forelimb contain fibers afferent for the excitor reflexes. (Authors' abstr.)

Metabolism of Brain Tissue Slices and Suspensions from Various Mammals.

1. The oxygen uptake rate of slices of cerebral cortex from various mammals is roughly inversely proportional to the tenth root of the average body weight of the individual adult of the species.

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2. There is considerable variability in the respiration rate of tissue from different individuals within a species. This variability is not obviously correlated with the size of the animal.

3. There is considerable variability in activity between tissue slices from the same animal. Slices from dorsal areas respire more actively than slices from lateral areas.

4. Figures for respiration rates of brain *in vitro* and *in vivo* are compared and discussed.

5. Brain tissue slices are capable of active aerobic glycolysis. Brain suspensions, which are capable of active anaerobic glycolysis, show little aerobic glycolysis.

6. For comparison with abnormal tissue, the relative activities of oxygen uptake, respiratory carbon dioxide evolution, aerobic and anaerobic glycolysis of brain suspensions from various animals have been compared under standard conditions. The relative anaerobic glycolytic activity increases with increasing size of animal. (Author's abstr.)

Respiration and Glycolysis of Focal Epileptogenic Human Brain Tissue.

1. The average rate of oxygen uptake by samples of human focal epileptogenic brain cortex is not significantly different from the probable average oxygen uptake rate of normal human cortex.

2. The relative rates of oxygen uptake, carbon dioxide evolution, aerobic and anaerobic glycolysis of focal epileptogenic brain tissue are not significantly different from those of normal brain tissue. (Authors' abstr.)

Influence of Drugs on Response of a Crustacean Synapse to Pre-ganglionic Stimulation.

The effect of drugs on synaptic transmission in the crayfish was investigated by means of successive periods of high-frequency stimulation.

Amyl trimethylammonium caused a large increase in the duration of the response to such stimulation. This potentiated state was maintained for long periods without change.

Nicotine likewise caused a marked increase in the duration of this response, but this potentiation was soon followed by depression or block. This in turn was followed by recovery.

The effect of eserine resembled that of nicotine, but the initial potentiation was not as great. The addition of acetylcholine to a sub-threshold dose of eserine was without effect.

Hexyl dimethylamine in small doses depressed the synapse without initial facilitation. Depression by this drug was maintained for long periods without change. Larger doses caused rapid block.

No effect of arsenate, arsenite, cyanide, or fluoride was noted, either directly on synaptic transmission or on the action of nicotine. (Authors' abstr.)

Synaptic Fatigue and Chemical Mediators of Post-ganglionic Fibers.

In cats under anesthesia with nembutal the prolonged stimulation at different frequencies is not followed by a decrease of acetylcholine in the cholinergic fibers or of adrenaline in the adrenergic fibers. (Authors' abstr.)

Reticulo-spinal Influences on Stretch Reflexes.

The outstanding feature of the decerebrate preparation is an exaggeration of stretch reflexes of antigravity muscles, without irradiation.

In the decerebrate cat, appropriate regions of the brain stem reticular formation, excited electrically, exert pronounced facilitatory or suppressor influences upon stretch reflexes. These influences are exerted upon flexor or extensor activity alike, and hence are non-reciprocal or generalized.

Observations of vestibular and cerebellar influences upon stretch reflexes are also presented. The former is facilitatory and ipsilateral and is evoked with low frequencies of stimulation. The latter is suppressor and requires a high frequency of stimulation for its activation. (Authors' abstr.)

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Excitation in Relation to Voltage Changes Along Nerve Surface.

Excitation of frog nerve was investigated in relation to voltage changes on the surface of the nerve induced by threshold rectangular current stimuli of various durations. It is assumed that voltage across the membrane in the extrapolar region is proportional to the voltage of the external fluid in accordance with the cable theory of core conduction.

For various durations of threshold current, curves of peak voltage as a function of extrapolar distance along the nerve surface were found to intersect at a locus corresponding to a region about 8 mm. distant from the cathode. In view of the very low magnitude of potential observed at such a great distance from the cathode, it is concluded that these findings do not offer a direct measurement of the minimal length of nerve which must be raised to a critical level of excitation prior to initiation of a propagated response.

In describing the time course of excitability at regions adjacent to the cathode a solution of the equation—

$$\frac{dx}{dt} = C(y)\ (P_0 - x) - k(x)$$

is found applicable as a first approximation. For this equation y is considered to be the concentration of a cation accumulated across the membrane capacity in direct proportion to the membrane voltage, and x is the fraction of a membrane constituent of original concentration P_0 which combines with y to form a complex which, when present in sufficient concentration, produces instability of some membrane component and hence leads to response of a nerve.

An electronic integrator is described which facilitates solution of the differential equation. (Author's abstr.)

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The Present Status of the Rorschach in Clinical and Experimental Procedures.

The Rorschach test has had an important and stimulating effect on the development of personality testing. Its value as a clinical instrument in the hands of experienced clinicians must be recognized.

The present status of research with the Rorschach places it in clinical use as a personal instrument. That is, its validity and clinical utility are dependent upon the person who uses it. It is, in its ordinary clinical use, primarily a subjective tool. There is little question that psychologists working in the field of classification of mental disease find it one of their best tools, particularly when they combine, consciously or unconsciously, their observations of the subject with their analysis of the test. The major caution in the use of the test in this setting is that the psychologist recognize that he does *not* have an objective tool, but simply another way of making observations such as he has in the interview, and that he treats his interpretations as *hypotheses*, not facts.

Caution must be exercised at this time in using the Rorschach as a known instrument in research against another unknown variable such as is done to study the effect of shock treatment, or the differences in personality under alcohol, or personality differences from one culture group to another. Too little is actually known about the Rorschach and the significance of responses in different cultural settings. The method may be suitable for studies of the relation of perception and motivation in the laboratory, where it is not necessary to assume a specific meaning for various types of responses.

If new experimental validation attempts are to be profitable, it appears that they must be carefully controlled for subjective bias. They must rely on the comparison of interpretations expressed in numerical ratings of variables with clearly defined referents with similar independent ratings of past or present behavior, rather than on classifications of disease entities. Perhaps most important is to remember that the Rorschach method involves many different hypotheses, not all of which are consistent with any one systematic approach to psychology. Researchers might well be concerned with testing individually the variety of principles involved in scoring and interpretation without feeling that the method as a whole must rise or fall with each study. (Author's abstr.)

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Studies in Epilepsy : Personality Pattern, Situational Stress, and the Symptoms of Narcolepsy.

From this study the following conclusions, perhaps applicable to the general problem of narcolepsy, may be drawn :

1. The life history and the personality pattern of the narcoleptic patient are characterized by conflict between emotional needs requiring relationships with others and denial of these needs expressed in a struggle for " independence."

2. Narcoleptic symptoms interrupt integrated activity in situations evoking the life problems when behavior is elaborating into patterns consciously unacceptable to the patient.

3. Narcoleptic symptoms also occur when the patient's interest in the environment is minimal and tension from internal needs is absent.

4. Narcolepsy, as a disease, may then be viewed as a pattern of discontinuous organism-environment integration in which interruptions occur whenever intolerable distress arises in the course of the existing integration, or whenever chronic distress and immediate decrease of biologic tensions reduce the degree of integration below the waking level. (Author's abstr.)

Treatment of Psychoses with Bilateral Ablation of a Focal Area of the Frontal Cortex.

(1) Beneficial effects resulting from frontal lobe surgery are due to alteration of the affective responses.

(2) This effect appears only if areas 9 and /or 10 are encroached upon at operation.

(3) A large percentage of cases in which more than two large Brodmann areas or several small cortical areas are removed will show signs of deterioration in social behavior. (This also occurred in the authors' lobotomy cases, where large amounts of cortex were undercut.)

(4) Patients whose overt psychotic symptoms are removed by operation show essentially the same basic personality traits that were present before the illness began.

(5) In chronic psychotics affect becomes divorced from ideation to varying degrees. This seldom occurs in cases other than schizophrenics and manics. As this disassociation increases, the prognosis with operation becomes less favorable. (Authors' abstr.)

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A Psychometric Differentiation of Alcoholics from Non-alcoholics.

1. A study of alcoholics and non-alcoholics revealed many significant differences in responses to personality items.

2. These differences were utilized in the construction of a 72-item test for the psychometric differentiation of the alcoholics studied from the non-alcoholics studied.

3. The results of the scores made on this test indicated that the alcoholics consistently made the higher scores and the non-alcoholics the lower scores.

4. With the use of a critical score of 21 it was possible to make 79 per cent. correct predictions for the male group. A critical score of 26 made possible a higher per cent. of predictions for the female group.

5. The test possesses a reliability coefficient of ·94.

6. The validity of the test was established, for the alcoholic and the non-alcoholic groups used in this study, by selecting highly diagnostic items, establishing high predictability, demonstrating statistically significant differences of mean scores, and by showing that alcoholics consistently made the higher scores and non-alcoholics consistently the lower scores.

7. It was not established that this test could differentiate alcoholics from non-alcoholic clinical deviants.

8. A subjective analysis of the questionnaire items resulted in the recognition of seven characteristics in alcoholics which pointed to the presence of neurotic and psychopathic traits. The seven traits noted were: Anxiety, depressive fluctuations, emotional sensitivity, feelings of resentment, failure to complete social objectives, feelings of aloneness, and poor interpersonal relationships.

9. It is suggested that further studies be carried out in which "pure" groups will be compared on this 72-item test. By this is meant the comparison of male alcoholics free of neurotic and psychopathic traits with male alcoholics who may be psychoneurotic or psychopathic. Alcoholic psychopaths should be compared with non-alcoholic psychopaths, alcoholic neurotics with non-alcoholic neurotics,

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and so forth. Similarly all the normal categories could be compared, e.g. normal abstainer versus normal social drinker; and normal groups with non-normal ones.

It is believed that the 72-item test developed may provide an exploratory technique for such studies. This test has been named "The Manson Evaluation," and will be available to professional workers. (Author's abstr.)

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1. Anatomy, Physiology and Biochemistry.

Influence of Anoxemia on the Appearance of Toxic Properties in Saliva. Krasnovskaya, L. A., and Efimov, V. V. [*Byull. Eksptl. Biol. Med.*, **24**, 104–5 (1947).]

In human experiments at simulated altitudes of 1,500–5,000 m. the toxicity of saliva was determined by the contractile activity of a fresh frog muscle in physiol. solution at 30°, in terms of time of immersion. The normal curve is a rectangular hyperbola (total time 0·5 hour). At elevation of 5,000 m. definite toxic properties are apparent in the saliva; slight toxicity is apparent at 4,000 m. elevation. The exposure to low pressure lasted 30–40 minutes in each case.

G. M. Kosolapoff (Chem. Abstr.).

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Canine Epilepsy Caused by Flour Bleached with Nitrogen Trichloride (Agene). I. Experimental Method. Silver, M. L., Zevin, S. S., Kark, R. M., and Johnson, R. E. (Univ. of Illinois, Chicago). [*Proc. Soc. Exptl. Biol. Med.*, **66**, 408–9 (1947).]

Methods of preparing the experimental rations are described. Separation of the gluten from the fat-free agene-treated flour showed that the convulsive activity was retained in the protein fraction. Casein treated with agene also produced convulsions in dogs. The experimental diets did not produce convulsions in monkeys, but the monkeys developed tremor of the extremities and weakness of the hind limbs, which persisted for weeks after the experimental diet was discontinued.

II. Role of Amino Acids. Silver, M. L., Monahan, E. P., and Klein, J. R. [*Ibid.*, 410–12.]

When an amino acid mixture approximating the composition of gliadin is treated with NCl_3 gas (agene) it is so altered as to make it convulsant for dogs when injected intravenously. L. E. GILSON (Chem. Abstr.).

Turnover of Phosphate in the Pineal Body Compared with that in Other Parts of the Brain. Borell, U., and Orstrom, A. (Wenner-Gren's Inst., Stockholm). [*Biochem. J.*, **41**, 398–403 (1947).]

The pineal body has the highest turnover of radioactive P of any portion of the rat brain. In the pineal the P^{32} changes occur in two ways; a rapid turnover of P^{32} which chiefly involves carbohydrate phosphate esters, and a slow turnover involving phospholipides and nucleic acids. A marked increase in the P^{32} turnover of the medulla oblongata occurs following extirpation of the eyes.
S. MORGULIS (Chem. Abstr.).

Chemical Nature of the Fatty Acids of Brain and Spleen Sphingomyelin: Occurrence of Saturated and Unsaturated Sphingosines in the Sphingomyelin Molecule. Thannhauser, S. J., and Boncoddo, Nicholas F. (J. H. Pratt Diagnostic Hosp., Boston). [*J. Biol. Chem.*, **172**, 141–7 (1948).]

Crude sphingomyelin (16 gm.) obtained from the ether-insoluble brain lipide fraction by fractionation with glacial HOAc-acetone mixture was suspended in water first and then in 320 c.c. of 0·25 N NaOH and shaken for 4 to 5 days. After acidification with glacial AcOH the mixture was left overnight in the cold. The precipitate which resulted was filtered, washed with acetone, and extracted with ether (Soxhlet) for 2 to 3 days. The contents of the thimble were taken up in petr. ether-MeOH (9:1) and filtered. The filtrate was concentrated and the phosphatide precipitated with excess acetone. The dried precipitate was dialyzed and was filtered after addition of acetone and dilute HCl. By running a petr. ether-MeOH solution of this precipitate through a column of Al_2O_3 traces of cerebrosides were removed. The sphingomyelin was recovered from the concentrated solution by precipitation with acetone and recrystallization from a mixture of hot EtOAc (800 c.c.) and MeOH (8 c.c.). Brain sphingomyelin free of hydrolecithin analyzed 3·28 per cent. N, 3·76 per cent. P. It is a white crystal substance, soluble in benzene, warm alcohol, and hot EtOAc, insoluble in ether and acetone. It discolors at 190–5°, m. 212–213°, $(\alpha)\,^{22}_{D} = +6{\cdot}25°$ (4 per cent. solution in $CHCl_3$–MeOH (1:1)); iodine number 42·5. From an acid hydrolyzate of brain sphingomyelin, stearic, nervonic, and lignoceric acids in the approximate proportions of 2:2:1 were isolated as well as sphingosine sulfate and dihydrosphingosine sulfate. Pure spleen sphingomyelin is a white crystal substance soluble in benzene, warm alcohol, hot EtOAc, insoluble in ether and acetone, m. 217° (α), $^{22}_{D} = +6{\cdot}25°$ (4 per cent. solution in mixture of $CHCl_3$–MeOH 1:1), iodine number 33·5. Upon acid hydrolysis, lignoceric and palmitic acids in 1:1 proportion and sphingosine sulfate were isolated. The iodine number of sphingosine from brain and spleen indicates that sphingomyelin consists of saturated and unsaturated sphingosine, in analogy to the composition of the cerebrosides. W. H. FISHMAN (Chem. Abstr.).

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Isolation and Identification of Hydrolecithin (Dipalmityl Lecithin) from Brain and Spleen. Thannhauser, S. J., and Boncoddo, Nicholas F. (J. H. Pratt Diagnostic Hosp., Boston). [*J. Biol. Chem.*, **172**, 135–9 (1948).]

The procedure for the isolation of hydrolecithin (I) from beef lung (*C.A.*, **41**, 3159*b*) has been applied to the lipides of brain and spleen. The large amounts of cerebroside (II) present in brain (but not in lung or spleen) are removed by prolonging the Me_2CO extraction to 3 days at 60°, and by precipitating the (II) still present in the petr. ether solution with MeOH before concentrating the solution of (I). The yield of (I) from 25 lb. of beef brains was 4 gm., m. 238–40°; no depression in mixed m.p. with (I) from lung; iodine number 5·65. Hydrolysis of 2·5 gm. (I) by refluxing for 4 hours with saturated aqueous $Ba(OH)_2$ gave 2·07 gm. crude Ba salt (III). Esterification of 2 gm. of (III) in 5 per cent. H_2SO_4 in MeOH and extraction of the Me ester (IV) with petr. ether gave, after evaporation, 1·25 gm. (IV). (IV) distilled at 0·002 mm. at 94–6°. The free acid obtained from (IV) proved to be palmitic acid. Analysis of the filtrate from the alkali hydrolysis for choline and Ba glycerophosphate showed that (I) from brain is identical with (I) from lung. The (I) from spleen was found, by mixed m.p., to be identical with that from lung and brain. J. P. DANEHY (Chem. Abstr.).

Vitamin B_1 and the Transmission of Nerve Impulses. Penas, Jose Bautista de las, and Francoli, Jose Luis Fernandez (Catedra farmacol. exptl., Madrid). [*Farmacoterap. actual (Madrid)*, **4**, 707–16 (1947).]

A theoretical review and discussion. A. E. MEYER (Chem. Abstr.).

Neurocerebral Paralysis Due to o-Tritolyl Phosphate Poisoning. Elsaesser, K. H. (Univ. Halle, Ger.). [*Z. ges. inn. Med.*, **2**, 749–54 (1947).]

Three cases of o-tritolyl phosphate poisoning are described in minute detail. One of the patients gave birth to a child about 4 months after the poisoning. The child also exhibited typical symptoms of poisoning and died 6 weeks after birth. The source of the poison could be traced to a poppy-seed cake. The poppy seeds, after oil extraction with trichloroethylene and removal of the solvent, had been carried for 10–12 hours in an Igelit bag. The latter is a rubber-like material which contains as a softener 30–40 per cent. of mixed tritolyl phosphates, only the ortho-isomer of which is poisonous. BRUNO VASSEL (Chem. Abstr.).

Influence of the Autonomic Nervous System on Intestinal Absorption of a Hypertonic Solution of Glucose (in Cats). Huidobro, F., Valdés, R., and Dávila, M. (Catholic Univ. Chile, Santiago). [*J. Pharmacol. Exptl. Therap.*, **92**, 336–44 (1948).]

The changes in volume and the absorption of glucose from 4 c.c. of a 10 per cent. solution of glucose placed in a loop of intestine about 16 cm. long with intact circulation was studied in cats anesthetized with nembutal. Normally there is an increase in volume with a later decrease, while the glucose is absorbed rapidly during the first few minutes and later more slowly. Atropine (injected intravenously) prevents much increase in the original volume, but does not affect glucose absorption. Prostigmine or ergotamine (injected intramuscularly) increases the volume of solution significantly; prostigmine does not affect glucose absorption, but ergotamine retards it. Stimulation of the splanchnic nerve in cats with intact adrenals does not affect volume or absorption, but in the absence of the adrenals it accelerates absorption of glucose. Acute section of the abdominal vagi also accelerates glucose absorption. Stimulation of the vagi causes an increase in solution volume and a decrease in absorption rate.

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

Significance of Vitamin E in the Development of Some Pathological Processes in the Nervous System. Mittel'shtedt, A. A. [*Nevropatol. i Psikhiat.*, **17**, 63–7 (1948).] G. M. KOSOLAPOFF (Chem. Abstr.).

Distribution of Ascorbic Acid in Autonomic Ganglia and its Alteration in Experimental and Pathologic States. Sulkin, N. M., and Kuntz, Albert (St. Louis Univ. School of Med., Missouri). [*Anat. Record*, **101**, 33–47 (1948).]

The ascorbic acid content of autonomic ganglia has been measured using acidified $AgNO_3$. The $AgNO_3$ appeared as granules in the fixed tissue. The ascorbic acid

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was found in both the ganglion cells and the neurological supporting cells in the autonomic ganglia of the cat, guinea-pig, rabbit and man. In the guinea-pigs the amounts found varied with the content in the diet. On deficient diets a decrease in the autonomic ganglia was observed. W. E. CORNATZER (Chem. Abstr.).

Carbonic Anhydrase in the Brain of Birds Born Self-sufficient and Those Born Non-self-sufficient. Pigareva, Z. D. [*Doklady Akad. Nauk S.S.S.R.*, **60**, 185–9 (1948).]

Chickens and rooks were used as representatives of the types of 2 birds. In adult birds maximum carbonic anhydrase activity is found in the cerebral hemispheres and cerebellum. Rooks have consistently higher level of the enzyme in the brain tissue than the chickens; almost no difference was found in the spinal cord. In chickens the enzyme level grows gradually, starting with the embryo, and adult values are found early after hatching. In rooks the enzyme activity is at embryonic level as late as 3 weeks after hatching, then leaps upward sharply (most noticeably in cerebellum) and increases 6-fold over a 20-day period, reaching 50 per cent. of adult level at 45 days, as determined in the cerebellum and similarly in cerebral cortex. In the spinal cord there is little difference between the young of both birds, and only after 15 days does the rook begin to have higher levels than the chicken. The enzyme level and activity of the bird after birth are correlated. Results are given graphically. G. M. KOSOLAPOFF (Chem. Abstr.).

Effect of Central Nervous System Depressants on the Emptying Time of the Human Stomach. Northup, David W., and Van Liere, Edward J. (*West Virginia Univ., Morgantown*). [*J. Pharmacol. Exptl. Therap.*, **93**, 208–9 (1948).]

The effect of therapeutic doses of chloral hydrate α-bromo-isovalerylurea (bromural), Na pentobarbital, and paraldehyde on the motility of the human stomach was studied. Consistently increased motility was found only with Na pentobarbital, indicating that sedation is not the principal factor responsible for the decreased emptying time seen with central nervous system depressants, such as Na amytal, previously reported. L. E. GILSON (Chem. Abstr.).

The Oxidation Mechanism of the White Matter of the Central Nervous System. Huszak, Istvan. [*Acta Chem. Scand.* (1), 813–17 (1947) (*in German*).]

The O activated systems of the white (I) and gray matter (II) of the central nervous system are different. (II) contains the Warburg-Keilin Fe-containing catalytic system, which is absent in (I). (I) contains approximately the same quantities of Fe and Cu, whereas the Fe is greater in (II). The O uptake (respiration) of (I) is checked by KCN or CO. Na diethylthiocarbamate strongly inhibits (I) respiration. These results indicate that the Cu-protein complex plays a large part in the catalytic O transport in (I). BERNARD KLEIN (Chem. Abstr.).

The Relation Between Starvation, Metabolic Acidosis and Convulsive Seizures in Rats. Davenport, Virginia D., and Davenport, Horace W. (*Univ. of Utah School of Med., Salt Lake City*). [*J. Nutrition*, **36**, 139–51 (1948).]

The electroshock threshold of rats increases as their body weight increases. If the caloric intake is retricted, it falls significantly, and it rises abruptly to normal when the restriction is removed. Supplemental administration of vitamins of the B complex or of agar to rats having low threshold as a result of restricted caloric intake has no effect on it. Administration of carbohydrate, fat or protein to rats having low threshold as a result of caloric restriction raises it, while administration of fat to normal rats lowers it. The threshold may either rise or fall when mild metabolic acidosis is produced by starvation or fat feeding. Mild metabolic acidosis produced by NH_4Cl has no effect on the threshold, but extreme metabolic acidosis raises it. W. B. ESSELEN, jun. (Chem. Abstr.).

Glycolysis of Brain Preparations: IV. Meyerhof, Otto, and Wilson, Jean R. (*Univ. of Penna., Philadelphia*). [*Arch. Biochem.*, **17**, 153–69 (1948); *cf. C. A.*, **42**, 233*f*.]

Glucose is more rapidly glycolyzed than fructose with rabbit-brain extract if the concentrations of adenosinetri- (I) and adenosinediphosphates (II) in the medium

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are low. The differences in rates could be eliminated by the addition of (I) or by keeping (II) and free sugar at a high concentration. The chief reason for differences in glycolysis rates observed between rabbit brain extracts and homogenates is the presence of apyrase, which is bound to the structural elements. With 2–6 γ of labile P from (I) the rate of glucose and fructose turnover is about the same as with living tissue. With a water extract of acetone-defatted and dehydrated rabbit brain, in which most of the apyrase was destroyed, hexose monophosphate is metabolized rapidly (one hexose monophosphate molecule was glycolyzed for each 2·5 molecules which were converted into hexose diphosphate). Phlorizin inhibits the transphosphorylation between phosphopyruvate and (II). Octyl alcohol and phenylurethan inhibit hexokinase and phosphohexokinase. Octyl alcohol does not inhibit apyrase. VERNON L. FRAMPTON (Chem. Abstr.).

Distribution of Glutamic Dehydrase in the Central Nervous System. Trampetti, Giovanni, and Vantaggi-Cozzari, Luciana (Univ. Perugia, Italy). [*Boll. soc. ital. biol. sper.*, **23**, 1109–10 (1947).]

Suspensions of a mash of gray and white matter of the brains of sheep, cattle and dogs exerted an enzyme action on glutamic acid, cleaving it into α-ketoglutaric acid and NH_3. This enzyme was present in larger amounts in the gray matter than in the white. HELEN LEE GRUEHL (Chem. Abstr.).

A Lipide Anticoagulant from Brain Tissue. Physiochemical Characteristics and Action in vitro and in vivo. Tocantins, Leandro M., Carroll, Robert T., and McBride, Thomas J. (Jefferson Med. Coll., Philadelphia, Pa.). [*Proc. Soc. Exptl. Biol. Med.*, **68**, 110–17 (1948).]

Two methods for separating a heat-labile lipide inhibitor of blood coagulation from acetone-dried brain tissue are described. The substance is of waxy consistency, readily soluble in Et_2O, MeOH, $CHCl_3$, CCl_4, C_6H_6, pyridine, glacial AcOH and warm EtOH, insoluble in Me_2CO and cold EtOH. It is not affected by oxidation or drying at room temperature. In a still impure form it m. 182–200°. A 10 per cent. solution in 0·85 per cent. aqueous NaCl has a pH of 6. It gives negative Molisch and protein tests. It differs in potency and other respects from similar known anticoagulants. It has a marked antithromboplastic activity, especially against homologous brain extracts in homologous plasma. It is weaker than heparin *in vitro* but has a more lasting effect than heparin *in vitro*.

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

A Laboratory Test for the Virus of Poliomyelitis. Lepine, Pierre R. (Inst. Pasteur, Paris). [*Science*, **108**, 134–5 (1948).]

Mice are inoculated with a concentrate of material supposedly infected and subsequently inoculated 2 days later with active Lansing mouse-adapted virus. Three out of five of these mice show temporary to permanentprotection (in a positive test), as contrasted with death of four out of five control animals on the 10th–11th day. Tests were made satisfactory with cord material from monkeys and with fecal material from patients. Extracts from normal human feces or cord material inactivated by heating showed no protective action.

WALTON J. SMITH (Chem. Abstr.).

Brain Excitability in Pyridoxine-deficient Rats. Davenport, Virginia D., and Davenport, Horace W. (Univ. of Utah School of Med., Salt Lake City). [*J. Nutrition*, **36**, 263–75 (1948).]

The electroshock thresholds (I) of rats mildly deficient in pyridoxine rises significantly within 5 hours after the rats are injected with pyridoxine. Cellular hydration reduces (I) to a similar extent in normal and pyridoxine-deficient rats. The concentrations of H_2O, Na, K and Cl in the brain and blood plasma and of lactic and pyruvic acid in the blood are the same in pyridoxine deficient and control rats. Both types of rats have a very mild degree of metabolic acidosis. When extra tryptophan is added to the diet of rats mildly deficient in pyridoxine, the signs of deficiency are intensified and there is a fall in (I). This fall can be reversed within 5 hours by the injection of pyridoxine. Xanthurenic acid when injected into normal rats has no effect on (I) or maximum seizure pattern. Feeding extra

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glutamic acid to rats mildly deficient in pyridoxine causes (I) to rise. Rats more severely deficient in pyridoxine show a slower rise in (I) after injection of pyridoxine, but if the animals have been fed extra glutamic acid for 6 days they respond to injected pyridoxine as rapidly as do mildly deficient rats. It is suggested that the maintenance of normal transaminase activity is essential for those tests of normal brain activity employed in this study.

W. B. ESSELEN, jun. (Chem. Abstr.).

Biochemical Development of the Chick Embryo Brain. Comparison of the Different Fractions of the Acid-soluble Phosphorus. Mandel, P., Bieth, R., and Stoll, R. (Univ. Strasbourg, France). [*Compt. rend. soc. biol.*, **141**, 1260–1 (1947); *cf. C. A.*, **42**, 1343*c*.]

Chick embryo brains were analyzed quantitatively after 10, 13, 16 and 19 days of incubation. The phosphoric esters remained about constant, but there was a rapid increase in creatine phosphate and decrease in pyrophosphate P between the 13th and 16th day; this seemed to coincide with the period of rapid myelinization.

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

Additional Investigation of the Variations in Neuro-muscular Excitability Caused by Atmospheric Depression in the Animal. Chauchard, B., and Chauchard, P. (École pratique Hautes-Études, Paris). [*Compt. rend. soc. biol.*, **142**, 6–7 (1948); *cf. C. A.*, **42**, 1645*c*).]

The decrease in chronaxia at simulated altitudes of 4,000–8,000 m. is discussed.

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

Mode of Intervention of the Nervous System in the Action of Morphogenic Hormones. Champy, C., Demay, M., and Samson, R. (Univ. Paris). [*Compt. rend. soc. biol.*, **142**, 13–14 (1948).]

Tissues sensitive to hormones, especially sex hormones, are richly innervated by the sympathetic system. In tissue cultures and grafts the hormones have no effect unless fragments of the sympathetic network are present. Hence the nerves must play a part in hormone action, possibly through chemical mediators. In spayed guinea-pigs dilute acetylcholine solution was injected into the vagina and uterus 4 times daily for 10–30 days. The changes produced in the vaginal epithelium and uterine mucosa were similar to those produced by small doses of folliculin. In winter (period of sexual inactivity) one thumb of the frog, *Rana esculenta*, was kept moistened with acetylcholine solution for 10 days. A callosity or spur and pigmentation developed on the treated thumb similar to the changes normally occurring during the breeding season (May). The other thumb remained unchanged. Thus in two diverse cases a chemical mediator of the nervous system produced effects like those of a sex hormone.

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

Muscular Contraction. Dissociation of the Contraction Responses to Acetylcholine and Electric Stimulation by Potassium Ion. Scheiner, Hermann (Conservatoire des arts et métiers, Paris). [*Compt. rend. soc. biol.*, **142**, 37–9 (1948); *cf. C. A.*, **42**, 5526*h*.]

Isolated frog rectus abdominis muscle treated with a solution of KCl loses its ability to respond to electric stimuli, but it responds about as usual to acetylcholine. Washing to remove K restores the sensitivity to electric stimuli.

Sensitization of Isolated Muscle to Acetylcholine by the Electric Current. Ibid., 40–2.

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

Phosphate Metabolism in the Hypophyseal-diencephalic System and Ovaries of Rats Determined by Means of P^{32}. Borell, U., Westman, A., and Orstrom, A. (Karolinska Sjukhuset, Stockholm). [*Acta Physiol. Scand.*, **15**, 245–53 (1948).]

In the tuber cinereum of the rat the P turnover reaches a maximum during pro-estrus and then decreases markedly. In the adenohypophysis the turnover is much greater than in the tuber, but the maximum metabolic activity is again

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reached during pro-estrus. In the ovaries the greatest P turnover occurs during pro-estrus and di-estrus. This is regarded as evidence in favor of assuming that the hypophysis and diencephalon may be regarded as a functional unit.

S. MORGULIS (Chem. Abstr.).

Experimental Histological Study of Neuroglia. Khlopin, N. G. [*Zhur. Obshchei Biol.* (*J. Gen. Biol.*), **8**, 473–93 (1947).]

Growth cultures, explanted or transplanted from optic nerve, lateral ventricle wall, spinal cord or other structures of embryonic or post-fetal rabbits were observed over periods of 4–50 days. In every case cells at centres of explants could be distinguished from astrocytes formed at tips of coarsely fibrous neuroglia. Optic neuroglia do differ, however, under conditions of extensive growth. Much of the prior literature on migration of neuroblasts and nerve cells in tissue cultures needs reinvestigation, since it neglects the histoblastic activity of neuroglia. All varieties of neuroglia and microglia have similar histoblastic capacity. When isolated they can change into macrophage-like cells which are not the same as macrophage of connective tissue. JULIAN F. SMITH (Chem. Abstr.).

Current Problems of Nerve Action in the Higher Animals. Orbeli, L. A. [*Zhur. Obshchei Biol.* (*J. Gen. Biol.*), **8**, 407–20 (1947).]

The work of Ivan Petrovich Pavlov and his students in nerve physiology is reviewed, including the refutation of chemical antagonism in favor of physiological action and counter-action in explaining the Hering phenomenon when assimilation and dissimilation conflict in the peripheral nervous system.

JULIAN F. SMITH (Chem. Abstr.).

Free Amino Acids in Cerebrospinal Fluid. Solomon, James D., Hier, Stanley W., and Bergeim, Olaf (*Univ. of Illinois, Chicago*). [*J. Biol. Chem.*, **171**, 695–700 (1947).]

Cerebrospinal fluids from 10 epileptic and 16 non-epileptic patients were assayed microbiologically for 11 individual free amino acids. Proteins present in the 40–80- c.c. samples were removed by heating 30 minutes at 100° at a pH of 4·7, and it was necessary to heat the protein-free filtrate for 2 hours longer on a boiling H_2O bath in order to remove some substance which otherwise inhibited the growth of the test organisms. Samples were adjusted to a pH of 6·8 and concentrated to a quarter their original volume, and were assayed by a procedure described earlier (*cf.* Hier *et al.*, *C. A.*, **41**, 2144*f*). For all 26 subjects average values in γ of amino acid per c.c. of spinal fluid were: Arginine $6 \pm 1{\cdot}4$, histidine $1{\cdot}7 \pm 0{\cdot}5$, isoleucine $0{\cdot}98 \pm 0{\cdot}5$, leucine $1{\cdot}4 \pm 0{\cdot}2$, lysine $2{\cdot}8 \pm 0{\cdot}8$, phenylalanine $1{\cdot}9 \pm 0{\cdot}7$, threonine $2{\cdot}8 \pm 0{\cdot}9$, tyrosine $2{\cdot}0 \pm 0{\cdot}7$, valine $2{\cdot}1 \pm 0{\cdot}5$, methionine $0{\cdot}4 \pm 0{\cdot}09$, and cystine $1{\cdot}8 \pm 0{\cdot}5$. Free proline could not be detected. Ranges of values for epileptics were about the same as those of non-epileptics. Values obtained on a composite sample from adults (ages 45 to 60 years) were higher than those on a composite sample from children (2 to 12 years). Analyses on hydrolyzed spinal fluid protein were also done. The results (expressed as amino acid N in per cent. of total N) were: Arginine 5·4, histidine 5·2, isoleucine 1·8, leucine 6·2, lysine 13·1, phenylalanine 3·2, threonine 4·1, tyrosine 2, and valine 5. Although the pattern of free amino acids in blood plasma followed closely the pattern of amino acids in plasma proteins, the pattern of free amino acids in spinal fluid did not follow that of the amino acids in spinal-fluid protein. Precipitin reaction tests indicated spinal fluid protein was composed largely of serum albumin.

CARTER D. JOHNSTON (Chem. Abstr.).

Penetration of Radioactive Sodium and Chloride into Cerebrospinal Fluid and Aqueous Humor. Wang, Jun-Ch'Uan (*Univ. of Minnesota, Minneapolis*). [*J. Gen. Physiol.*, **31**, 259–68 (1948).]

By use of radioactive Cl^{38} and Na^{24} the rate of penetration across the blood-aqueous humor and blood cerebrospinal fluid barriers was measured following intravenous injection. The rate calculated as the time required for the labeled-ion concentration to reach 50 per cent. that of the plasma was found to be $34{\cdot}3 \pm 9$ and $27{\cdot}3 \pm 9$ minutes (aqueous humor), and 90 ± 6 and 95 ± 6 minutes (cerebrospinal fluid) for Cl^{38} and Na^{24} respectively. S. MORGULIS (Chem. Abstr.).

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Ultraviolet Absorption Spectrum of Human Cerebrospinal Fluid. Hack, M. H. (Univ. of Illinois Coll. Med., Chicago). [*Biochem. J.*, **41**, 522–4 (1947).]

The ultraviolet absorption spectrum of human cerebrospinal fluid suggests the presence of at least 2 absorbing constituents, predominantly P-free protein and ascorbic acid. S. MORGULIS (Chem. Abstr.).

Lipides in the Spinal Fluid in Pernicious Anemia. Lipemia, the Neural Component, Gastric Secretion, and Their Interrelation. Cassafousth, C. F., Cárrega, Brage, Diego, and Rivas, Lucio (Hosp. Durand, Buenos Aires, Arg.). [*Semana med. (Buenos Aires)* (1), 403–8 (1948); *cf. C. A.* **42**, 2671.]

The lipoids in the spinal fluid in pernicious aneomia are increased, especially the phospholipides, free, and esterified cholesterol. The neurological symptoms coincide with high phospholipide values. As the clinical picture improves with liver therapy, the level of all lipoidal constituents drops. Glossitis and gastric acidity also show parallel improvement. The blood lipoids behave differently in that during the reticulocyte response the phospholipides and cholesterol increase, while the total lipide content decreases. The various lipoid constituents show no parallelism in the blood or in the spinal fluid. A. E. MEYER (Chem. Abstr.).

Diagnostic Value of Comparative Examination of Spinal Fluid Composition at Various Heights of the Subarachnoidal Space. Mandel'boim, A. B. (Molotov Med. Inst., Alma-Ata). [*Byull. Eksptl. Biol. Med.*, **24**, 359–64 (1948).]

A considerable increase of protein and positive globulin test are characteristic for tubercular spondylitis, sarcomatosis of the spinal cord sheath, and extra-medullary tumors. Accumulation of Ca in the lumbar fluid is observed in intra- and extramedullary tumors, sarcomatosis of the brain sheath and tubercular spondylitis. The same ailments also lead to lowered sugar level in the lumbar fluid ; the first two diseases also are characterized by increased lipoid level in the lumbar fluid. In all cases the Wassermann test is negative in both suboccipital and lumbar punctures. G. M. KOSOLAPOFF (Chem. Abstr.).

Protein Content of the Spinal Fluid in Spinal Subarachnoid Block : A Report on 838 Double Punctures. Wagner, Frederik F. (Serafimer-Lasarett, Stockholm, Sweden). [*Acta Psychiatrica et Neurolog.*, **22**, 283–301 (1947).]

Spinal fluid proteins were determined by Bisgaard's HNO_3 method. There was no definite correlation between hyperalbuminosis and hydrodynamic black, but the parallelism was better in cases of intermedullary tumors, neurinomas and extradural tumors than of meningiomas and compressive processes. The protein of the lumbar fluid was more often increased than that of the cisternal, but there was no special significance to the ratio of the lumbar to cisternal protein.
H. L. WILLIAMS (Chem. Abstr.).

The Influence of the Blast Wave on the Biochemical Ingredients of the Blood and Cerebrospinal Fluid. Kometiani, P. A. [*Trans. J. Beritashvili Physiol. Inst.*, **6**, 115–36 (1945) ; *Biol. Abstracts*, **21**, 807 (1947).]

An analysis was made of physical and chemical changes evoked by the blast wave in the blood and cerebrospinal fluid of dogs. Only slight changes were observed in the electrolyte content of serum and cerebrospinal fluid. The sugar content of these fluids, however, increases immediately after the blast. Hyperglycemia continues for 5–15 days. Alkali reserve and O capacity of blood decrease. Protein content and viscosity of plasma undergo no change or are altered only slightly. The chemical structure of oxyhemoglobin in erythrocytes does not change. M. F. R. (Chem. Abstr.).

Histochemical Demonstration of the Presence of Choline in Nerve Endings. Coujard, R. (Univ. Paris). [*Compt. rend. soc. biol.*, **142**, 15–16 (1948).]

Tissue sections are treated with Reinecke reagent, then washed. Choline is precipitated as a pink compound, which is difficult to see under an ordinary microscope although it photographs well. The crystals are birefringent, and are readily seen with a polarizing microscope. L. E. GILSON (Chem. Abstr.).

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Effect of Convulsant and Anticonvulsant Agents on Acetylcholine Metabolism (Activity of Choline Acetylase, Cholinesterase) and on Sensitivity to Acetylcholine of Effector Organs. Torda, Clara, and Wolff, Harold G. (Cornell. Univ. Med. Coll., New York, N.Y.). [*Am. J. Physiol.*, **151**, 345–54 (1947).]

Metrazole and picrotoxin increased acetylcholine synthesis; NaBr and trimethadione did not modify it, and scilliroside, digitoxin, camphor, morphine, strychnine, the barbiturates, and hydantoin and its derivatives decreased. Strychnine, morphine, scilliroside, metrazole, picrotoxin, and methylphenylethylhydantoin decreased the activity of cholinesterase; NaBr increased it. The acetylcholine sensitivity of striated muscle, used as an indicator of the acetylcholine sensitivity of effector organs in the cholinergic system, increased in the presence of metrazole, picrotoxin, morphine, and to a small extent in the presence of phenobarbital, diallylmalonylurea and Na isoamylethylbarbiturate; the acetylcholine sensitivity was not modified in the presence of trimethadione, Na barbital, and digitoxin, and was decreased in the presence of the other substances. The K sensitivity of striated muscle usually increased in the presence of lower concentrations of the substances used, and often decreased in the presence of higher concentrations. Although an accumulation of acetylcholine may precipitate convulsions, it is not the primary factor in their induction.

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

Action of Acetylcholine on the Peripheral Mechanisms which Support the Tone of the Blood Vessels. Rassalova, V. P. (Med. Inst. Frunze, Russia). [*Byull. Eksptl. Biol. Med.*, **24**, 95–7 (1947).]

In experiments with dogs (under morphine narcosis, 0·05 gm./kgm.) and cats (urethan narcosis 1 gm./kgm.) in which a rapid intra-arterial injection of 3–10 c.c. 20 per cent. NaCl is made to raise the blood pressure, followed by 0·8–1 mgm./kgm. eserine intravenously, then 4–8 minutes later by acetylcholine intravenously (0·00002–0·00005 gm./kgm.), there was observed either complete disappearance or great diminution of the pressor response to the NaCl. Eserine alone did not have this property. NaCl injection after acetylcholine administration is very feebly expressed and has only an extremely short duration. Acetylcholine, therefore, has a specific depressing action on the pressor reaction of blood vessels to irritation by certain chemical reagents; the effect may be described as a paralysis of the peripheral mechanisms which maintain the tone of the vessels.

G. M. KOSOLAPOFF (Chem. Abstr.).

Pharmacology and Biochemistry of Acetylcholine. Fuortes, Michelangelo G. F. (Univ. Torino, Italy), and Torre, Michele. [*Riv. patol. nervosa e mentale*, **60**, 352–73 (1942).]

After a review of pharmacology and biology data on acetylcholine (I), results are reported on experiments concerning the effect of (I) injections on the arterial pressure of dogs under barbituric narcosis, especially with regard to the intramuscular administration of (I). It was found that, under these circumstances, the action of (I) is not transient, but it lasts, on an average, 40 minutes (average intramuscular dose 5 mgm. per kgm. body weight).

C. SCANDURA (Chem. Abstr.).

Elimination of Action of Acetylcholine on Central Nervous System by Atropine. Babskii, E. B. [*Doklady Akad. Nauk S.S.S.R.*, **59**, 613–16 (1948).]

After atropinization the electric activity remains, but acetylcholine effect is eliminated. This argues against theories of acetylcholine action in manifestation of electric activity which have arisen recently. Dogs, given morphine (0·03 gm./kgm.), then ether narcosis, were trepanized and the chronaxia of the motor zone of the cortex was determined, using non-polarizing point Ag electrode; after establishment of the base-level, acetylcholine (25–100 γ/kgm.) was introduced; this was then followed by atropine (0·4 mgm./kgm.), and the effect on chronaxia was determined as usual. The results are given graphically. Similar experiments were also run on the visual brain segments of the frog.

G. M. KOSOLAPOFF (Chem. Abstr.).

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The Effect of Acetylcholine on the Heart: An Electro-cardiographic Study in the Dog. *Wilburne, M., Schlichter, J. G., and Simon, A. J.* (*Michael Reese Hosp., Chicago*). [*Arch. intern. pharmacodynamie*, **76**, 63–71 (1948).]

Injection of acetylcholine into dogs caused a depression of the P-Q segment, of the S-T segment, a large T-wave, A-V block, and a long delay in the appearance of ventricular escape. This suggests direct action of acetylcholine on the ventricle. Auricular fibrillation also occurred. M. L. C. BERNHEIM (Chem. Abstr.).

High Serum-acetylcholine Concentrations in Pernicious Anemia and Their Reduction by Effective Therapy. Davis, John E. (*Univ. of Arkansas School of Med., Little Rock*). [*Am. J. Digestive Diseases*, **15**, 52–5 (1948); *cf. C. A.*, **41**, 2803*c*.]

The acetylcholine content of normal human serum was found to be 6·6 to 8·2 γ per cent. by biological tests. Five patients with pernicious anemia had 15 to 33 γ per cent. These values returned to normal when pteroylglutamic acid or liver extract was administered. W. E. CORNATZER (Chem. Abstr.).

Effect of Creatine Phosphate and Its Decomposition Products on the Acetylcholine Muscle Contraction. Minaev, P. F. (*Acad. Med. Sci., Moscow*). [*Byull. Eksptl. Biol. Med.*, **24**, 290–2 (1947); *cf. C. A.*, **41**, 5206*d*.]

In experiments with frog stomach muscle it was shown that while immersion in 1 : 1,000–1 : 100,000 solutions of creatine phosphate does not produce contraction, subsequent immersion into acetylcholine solution gives considerably more pronounced contraction than in controls; at 1 : 10,000 concentration the sensitizing effect was maximum (36 per cent. increase). In a series of experiments with immersion in mixed solutions containing 1×10^{-6}–2×10^{-7} acetylcholine and the following substances listed below, the increased contractile activity is given in per cent. over control figures: Creatinephosphate (1×10^{-4}) 16 per cent.; creatine (1×10^{-4}) 0 per cent.; Na pyrophosphate and orthophosphate (1×10^{-4}) 0 per cent.; creatine and Na pyrophosphate simultaneously 14 per cent.; creatine and orthophosphate simultaneously 9·6 per cent. G. M. KOSOLAPOFF (Chem. Abstr.).

Estimation of Acetylcholine Content of Nervous Tissue. Hobbiger, F., and Werner, G. (*Univ. Wien, Austria*). [*Arch. intern. pharmacodynamie*, **76**, 117–31 (1948).]

After freezing various parts of the frog central nervous system with liquid air, only 1/15 of the usual amount of free acetylcholine and 2/5 of the bound acetylcholine is found. This is due to loss accompanying thawing before eserine inhibits the esterase. Perfusion with eserine before grinding the tissue increases the yield of free acetylcholine 2 γ/gm. M. L. C. BERNHEIM (Chem. Abstr.).

Role of Acetylcholine in the Activity of Sensori-motor and Suppressor Areas of the Cortex. Beckett, Sibyl, and Gellhorn, E. (*Univ. of Minnesota, Minneapolis*). [*Am. J. Physiol.*, **153**, 113–20 (1948).]

The topical application of acetylcholine, eserine and cholinesterase prepared from pancreas of dogs exerts the following effects on the cortex of the brain in cats and monkeys: Eserine with acetylcholine stimulates suppressor areas as indicated by temporary suppression or diminution of cortical electric activity, and by temporary elimination of the responsiveness of the motor cortex to electric stimulation as recorded by electromyograms. These substances also increase the responsiveness of the cortex to afferent stimuli as indicated by electrocorticograms. Cholinesterase diminishes cortical activity and the responsiveness to afferent stimuli. Acetylcholine is linked up with the process of excitation in motor, sensory and suppressor neurons on the cortex. E. D. WALTER (Chem. Abstr.).

Acetylcholine Antagonists: A Comparison of their Action in Different Tissues. Elio, F. Javier de (*Dept. Pharmacol., Oxford*). [*Brit. J. Pharmacol.*, **3**, 108–12 (1948).]

The relative local anesthetic potency, taking I as the value of procaine (I), for the compounds tested was: Cocaine (II) 7·4, amethocaine (III) 8·0, nupercaine

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(IV) 10·0, quinidine (V) 1·5, trasentin--6H (VI) 1·0, and atropine (VII) 0·5. All 7 compounds diminished the action of acetylcholine (VIII) on the frog rectus in a suitable concentration. (VI and (VII) in low concentration increased the action of (VIII). The potency of the compounds on the rectus in relation to one another is in the same order as their local anesthetic potency, but (VI) is much more potent on the frog rectus than as a local anesthetic. All 7 compounds diminished the stimulant action of (VIII) on the rabbit intestine ; (II) and (III) had the same activity as (I), (IV) was 4 times, (V) 6 times, (VI) 1,500 times and (VII) 3,000 times as active as (I). (I), (V), (VI) and (VII) depress the action of (VIII) on the heart, (II) is without action, and (III) and (IV) augment the action of (VIII) on the heart. All abolish the constrictor effect of (VIII) in the blood vessels of the rabbit's ear, (I), (III) and (IV) having the same activity, (V) weaker, (II), (VI) and (VII) stronger than (I). H. O. SINGHER (Chem. Abstr.).

Effects of Acetylcholine, Adrenaline, and their Antagonists (Atropine, Yohimbine) on Nerve Excitability in Rats. Chauchard, B., Chauchard, P., and Mazoué, Henriette (École pratique hautes-études, Paris). [*Compt. rend. soc. biol.*, **142**, 131–2 (1948).]

Effects on chronaxia are discussed. L. E. GILSON (Chem. Abstr.).

Cholinesterase Kinetics in the Living Animals. Fuortes, Michelangelo G. F. (Univ. Torino, Italy) and Torre, Michele. [*Riv. patol. nervosa e mentale*, **60**, 374–80 (1942).]

Considering the time of action of intramuscularly injected acetylcholine and the permanence of the substance in the organism at least for the whole period of action, the authors conclude that the cholinesterase activity *in vivo* is much lower than that which has been found for tissue extracts. Acetylcholine duration in the organism is related to the quantity introduced and to the concentration achieved in the circulation. Therefore, " units of cholinesterase capacity " *in vivo* cannot be considered without relating capacity to the concentration of the initial substrate, and, on the other hand, results *in vitro* cannot be referred immediately to the living animal. C. SCANDURA (Chem. Abstr.).

Effect of Acetylcholine and of Inactivators of Cholinesterase on the Spontaneous Electrical Activity of Frog Nerve Centers. Artem'ev, V. V., and Babskii, E. B. [*Doklady Akad. Nauk S.S.S.R.*, **59**, 393–6 (1948).]

Electric potentials of the visual sections of frog brain were examined either on animals with intact circulation and destroyed spinal cord, or on isolated heads. The active electrode was placed on the brain section, while the ground electrode was placed at brain section on the level of the smell centers ; the potentials were examined by an oscillograph. The results are given graphically. Action of acetylcholine or its inactivators (eserine or prostigmine) was studied by application of suitably moistened filter-paper to the sight centers. Acetylcholine, without preeserinization, was used at 1×10^{-4}–1×10^{-5} ; eserine was used at 2×10^{-5}–$2{\cdot}5 \times 10^{-6}$; prostigmine at 1×10^{-5}–2×10^{-6}. Acetylcholine alone shows its effect only at 1×10^{-4}–1×10^{-5} concentration and is manifested by increased amplitude of all oscillations. In combined acetylcholine-eserine application the effect starts at much lower level ; at 10^{-8} acetylcholine enhances the oscillations ; at higher concentrations the effect is decreased, and occasionally is absent entirely. Eserine and prostigmine (1–2×10^{-5}) enhance activity if the normal levels are fairly low ; at high normal activity they have a suppressing effect. Acetylcholine thus acts as a regulator of activity level of the nerve center which liberates it. G. M. KOSOLAPOFF (Chem. Abstr.).

Structure of Cholinesterases. II. Further Studies on the Electrophoretic Behavior of the Esterase in Horse Serum. Werner, G., and Kraupp, O. (Univ. Wien, Austria). [*Arch. intern. pharmacodynamie*, **76**, 1–12 (1948) ; *cf. preceding abstract.*]

From the activity of the enzyme concentrated at either anode or cathode, depending on the pH, it is concluded that it consists of two factors, which can be partially separated.

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III. The Dissociation Constant of the Enzyme in Horse Serum. Kraupp, O., and Werner, G. [*Ibid.*, 13–24.]

By dilution of serum at various temperatures the existence of two enzymes with different dissociation constants is indicated.

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

The Structure of Cholinesterase in Horse Serum. Kraupp, I. O., and Werner, G. (*Univ. Wien, Austria*). [*Arch. intern. pharmacodynamie*, **75**, 288–306 (1948).]

The intact enzyme has an isoelectric point at 5·2. It can be partially separated into a component having an active acid group with a pH about 6·0, and another having an isoelectric point between pH 3·0 and 5·0.

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

A New Type of Cholinesterase. Zeller, E. A. (*Univ. Basel, Switz.*). [*Helv. Physiol. et Pharmacol. Acta*, **6**, C36–7 (1948) (*in German*).]

Cobra venom hydrolyzes acetylcholine and Et chloroacetate, singly or both together in the same solution. Both actions are inhibited by physostigmine, and the same enzyme is responsible for both actions. This is a new type of cholinesterase. Viper venom does not hydrolyze acetylcholine.

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

Preparation of True Cholinesterase. Scheiner, H. (*Conservatoire arts et metiers, Paris*). [*Compt. rend. soc. biol.*, **142**, 36–7 (1948).]

Blood corpuscles are washed 3 times with 0·9 per cent. NaCl solution, then hemolyzed with 5 volumes of distilled water. The stromata are removed by centrifuging, and dilute HCl is added to the clear red solution to a final concentration of approximately 0·01 N. The precipitate, which contains 95 per cent. of the original cholinesterase activity, is washed with successive portions of distilled water, centrifuging each time, until hemoglobin is removed. The residue, still containing 70–75 per cent. of the original enzyme activity, is dissolved by adding just sufficient 1 per cent. $NaHCO_3$ solution, then diluted as desired. At pH 8·0–8·6 the enzyme is not adsorbed from solution by fuller's earth or kaolin; at pH 6–7 it is adsorbed by kaolin. Upon elution from kaolin by dilute alkali only 20 per cent. is recovered. In 0·5 per cent $NaHCO_3$ solution the cholinesterase is completely inactivated by heating 3 minutes at 65°, and 20 per cent. destroyed in 30 minutes at 55°.

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

Cholinesterase. (1) *A New Method of Calculating Enzymic Activity. Arragon, G., and Sala, E.* (*Etablissement Roussel, Paris*). [*Bull. soc. chim. biol.*, **30**, 44–50 (1948).]

The usual methods of measuring cholinesterase activity are quite arbitrary. It should be more logical to express the activity in terms of the initial velocity as the angular coefficient of the tangent to the hydrolysis curve at its origin. This factor is independent of the concentration of the substrate and directly proportional to the concentration of enzyme. Examples and experimental data are given. The authors propose as a unit the quantity of cholinesterase necessary to make the angular coefficient of the tangent to the hydrolysis curve at its origin equal to 1, when the acetylcholine hydrolyzed is expressed in mgm. and the time in minutes.

(2) *Extraction from red corpuscles. Arragon, G., and Sala, E.* (*Etablissement Roussel, Paris*). [*Ibid.*, 51–4.]

Low temperatures are used throughout. The corpuscles are washed 4 times with 0·9 per cent. NaCl solution, then hemolyzed with distilled water saturated with $CHCl_3$. The solution is clarified by centrifuging, then a little diatomaceous earth is added, the pH is adjusted to 5·2–5·3 with HCl to precipitate the cholinesterase and the mixture is centrifuged. The sediment is washed 3 times with distilled water acidified to pH 5·3 with HCl. The enzyme is eluted from the washed residue with 4 successive portions of dilute NH_4OH of pH 8·0–8·2. The eluate

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contains 80–90 per cent. of the original activity. This crude preparation is further purified by adsorption on $Ca_3(PO_4)_2$ at pH 5.4 and elution with several portions of dilute NH_4OH of pH 8·2. The resulting dilute solution can be concentrated *in vacuo* at 37° and pH 7·4 with very little loss of enzyme activity.

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

Investigation of Cholinesterase in Human Blood Serums. Brecht, Karl (Univ. Tubigen, Ger.). [*Deut. med. Wochschr.*, **72**, 445–9 (1947).]

With a titration method based on the splitting of acetylcholine (I) by the cholinesterase (II) of blood at pH 8·4 and body temperature (37–38°), Brecht found a 300 per cent. variation in (II) in healthy men and women with a variation of 50 per cent. in the most common range. Muscle activity increased the (II) in blood as a counter-action to increased (I) formation. The (II) values in 2 cases of myotonia were relatively high, and in one case of myasthenia gravis (II) was low, but within the extreme ranges of values for healthy individuals.

GEORGE K. DAVIS (Chem. Abstr.).

The Influence of Local Disturbances of the Blood System on Blood Cholinesterase. Schummelfeder, Norbert (Univ. Greifswald, Ger.). [*Klin. Wochschr.*, **24/25**, 113–15 (1946).]

The effect of burning and freezing of the extremities on serum cholinesterase (I) activity of dogs was determined. (I) activity increased with each treatment, but values decreased when burning ceased and increased when freezing was discontinued. The latter effect is explained on the basis that the full effect of freezing does not occur until thawing begins. In the case of complete circulatory collapse from burning, (I) activity continued to increase. Results for whole blood were not clear.

JAMES F. HOGG (Chem. Abstr.).

Changes in Serum Cholinesterase Activity in Anaphylaxia. Heim, Fritz (Univ. Marburg, Ger.). [*Klin. Wochschr.*, **24/25**, 115–16 (1946).]

Serum cholinesterase activity of sensitized guinea-pigs was determined before and after release of shock. Activity was increased at 20 minutes after release of shock, but was decreased at 1 hour. After 2 hours inhibition was 15 per cent. Separate experiments showed that the shock liberated enough histamine (a concentration of 1 : 53,600 completely inhibited human serum cholinesterase activity) to explain the decreased activity.

JAMES F. HOGG (Chem. Abstr.).

Effects of Anticholinesterases on Direct and Indirect Stimulation of Striated Muscle. Lowe, Charles R., and Gesell, Robert (Univ. of Michigan, Ann Arbor). [*Am. J. Physiol.*, **153**, 355–63 (1948).]

A comparative study of the action of several anticholinesterases on muscle and nerve-muscle preparations of the frog was made: Physostigmine sulfate, prostigminemethylsulfate, diisopropyl fluophosphate (DFP), CO_2, and strychnine sulfate. All were dissolved in Ringer-Locke solution in various concentrations. There was a diminution of response of the muscle to stimulation with each cholinesterase.

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

Action of Adrenaline on Cholinesterase Activity. Belenkov, N. Yu (Acad. Med. Sci., Leningrad). [*Fiziol. Zhur.* (*J. Physiol.*), **34**, 223–7 (1948).

Action of adrenaline on cholinesterase activity in the brain of *Rana temporaria* was studied *in vitro*; the test object was the rectus abdominis muscle of the frog. Adrenaline in 10^{-7}–10^{-8} concentration hinders the cholinesterase activity; weaker solutions (10^{-9}–10^{-10}) do not affect the extent of the response to acetylcholine (10^{-6}–10^{-7}) of uneserinized transversely striped muscle; higher concentrations of adrenaline (10^{-6}–10^{-7}) gave an increased response in 53 per cent. of cases, a decreased response in 21 per cent. of cases, and no effect in 16 per cent. The concentrations are given in gm. per ml. of the solution used for the immersions.

G. M. KOSOLAPOFF (Chem. Abstr.).

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2. Pharmacology and Treatment.

" Pellagragenic " Inactivity of 3-Indoleacetic Acid in the Rat. Rosen, F., and Perlzweig, Wm. A. (*Duke Univ., Durham, N. Carolina*). [*Arch. Biochem.*, **15**, 111–14 (1947).]

3-Indoleacetic acid administered over prolonged periods to growing rats maintained on a low-protein, low-niacin diet failed to retard growth, impair food utilization, or produce any discernible reduction in the tryptophan-niacin transformation.
VERNON L. FRAMPTON (Chem. Abstr.).

Calcium Content of Brain and Muscle Tissues in Narcosis. Meglirskii, P. P., and Zinov'eva, M. T. (*1st Med. Inst., Leningrad*). [*Byull. Eksptl. Biol. Med.*, **12**, 264–7 (1941); *cf. C. A.*, **41**, 6613*a*).]

The Ca contents of brain and muscle of guinea-pigs and rats were determined in the normal state and following 30 minutes Et_2O narcosis. The brain tissues were freed of blood before analysis by bleeding with a canule in the aorta, followed by washing with physiol. solution. In normal guinea-pig brain Ca varied from 17·7 to 32·52 mgm. per cent. and 24·8 to 124·05 mgm. per cent. respectively, after Et_2O narcosis. Rat brains showed a similar increase of Ca, from 37·82 mgm. per cent. average in the normal state, to 60·36 mgm. per cent. in the narcotic state. Muscle tissue also increased its Ca content in narcosis from 37·68 mgm. per cent. normal to 60·91 mgm. per cent. in the narcotic state.
G. M. KOSOLAPOFF (Chem. Abstr.).

Blood-Sugar Values in Poisoning with Hypnotics. Colldahl, Helge (*Univ. Clinic Lund, Sweden*). [*Acta Med. Scand.*, **129**, 257–63 (1947).]

In some persons poisoned with hypnotics the blood-sugar level is low, although the usual hypoglucemic symptoms are not manifested because of the unconscious state. It is suggested that the administration of glucose is of great therapeutic importance.
S. MORGULIS (Chem. Abstr.).

Ability of Diisopropyl Fluophosphonate (DFP) to Produce Antidromic Activity in Motor Nerves. Masland, Richard L. (*Univ. of Pennsylvania, Philadelphia*). [*Proc. Soc. Exptl. Biol. Med.*, **66**, 544–5 (1947).]

In cats DFP produced effects similar to those of eserine and neostigmine, presumably by inhibiting cholinesterase activity.
L. E. GILSON (Chem. Abstr.).

Effect of Various Anesthetics and Decerebration on the Stimulating Action of Carbon Dioxide on Respiration in Cats. Wang, S. C., and Nims, L. F. (*Yale Univ.*). [*J. Pharmacol. Exptl. Therap.*, **92**, 187–95 (1948).]

Methods are described. The control ventilation and the sensitivity of the respiratory system to increased CO_2 are not appreciably altered by urethan (1 gm./kgm. intraperitoneally) or by midbrain decerebration. Nembutal (35 mgm./kgm. intraperitoneally) or chloralose (75 mgm./kgm. intravenously) markedly depresses the control respiration and the respiratory response to increased CO_2 in the inspired air.
L. E. GILSON (Chem. Abstr.).

An Electro-encephalographic Analysis of the Action of Amidone, Morphine and Strychnine on the Central Nervous System. Leimdorfer, A. (*Univ. of Illinois, Coll. of Med., Chicago*). [*Arch. intern. pharmacodynamie*, **76**, 153–62 (1948).]

The electro-encephalogram of the parietal and occipital lobes was determined in cats. Amidone-HCl (methadon) (3 mgm./kgm.) injected intravenously produces transitory diphasic spikes alternating with decreased voltage. Doses of 18 mgm./kgm. produce transitory high-voltage high-frequency discharges, and 22·5 mgm./kgm. abolishes all electric activity. Morphine sulfate (5 mgm./kgm.) administered subcutaneously produces a slight increase in the frequency, 40 mgm./kgm. intravenously causes a decrease in frequency, and another 40 mgm./kgm. abolishes electric activity. Strychnine (0·5 mgm./kgm.) by either route causes diphasic spikes in the spinal cord which are independent of those in the brain. In the mouse, elevation of the tail is a normal reflex stimulated by the three drugs at different loci in the central nervous system.
M. L. C. BERNHEIM (Chem. Abstr.).

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Pain and Euphoria. Pharmacological Advances. Wolff, P. O. [*Ciencia e invest. (Buenos Aires)*, **4**, 186–98 (1948).]

The pharmacology of metopon (methyldihydromorphinone), amidone (6-dimethylamino-4,4-diphenyl-3-heptanone) and synhexyl (1-hydroxy-3-n-hexyl-6,6,9-trimethyl-7,8,-9,10-tetrahydro-6-dibenzopyrane) is reviewed.

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

Mechanism of the Hypochloremia from Barbiturate Narcosis in Mussels. Florkin, Marcel, and Douin, Jean (Univ. Liége, Belg.). [*Bull. soc. roy. sci. Liége*, **12**, 596–8 (1943).]

Blood Cl was measured at intervals after the injection of veronal Na. A decrease in Cl was observed when the mussels were kept in water, but not when they were maintained in a humid atmosphere after injection. It was concluded that the observed hypochloremia was the result of simple diffusion into the external medium. FRED. H. SNYDER (Chem. Abstr.).

Neuro-muscular Block by Pilocarpine. Coppée, G. [*Bull. soc. roy. sci. Liége*, **12**, 468–70 (1943).]

The action of pilocarpine (I) was studied on isolated nerve-muscle preparations of the frog. Neuro-muscular transmission is blocked by (I) at a concentration of 1 : 1,000. The effect of (I) is increased rather than antagonized by atropine. Guanidine and veratrine counteract (I). Chemical excitability of muscle is not greatly modified by (I), the muscle retaining its sensitivity to K ions and to acetylcholine. FRED. H. SYNDER (Chem. Abstr.).

Physiological Action of Parpanite and Curare Based on Self-experimentation. Heuscher, J. E., and Schoelly, M. L. (Univ. Basel, Switz.). [*Schweiz. med. Wochschr.*, **78**, 509–12 (1948).]

Intravenous injection of 12 mgm. of parpanite (I) produces after 2 minutes a slight haziness of vision. After 6 minutes there is hoarseness of voice, sensation of heat, reddening of the face, acceleration of pulse, palpitation and slight nausea. There is disturbance of voluntary breath control, and some difficulty in concentrating and in speaking. After 9 minutes there is a partial return toward normal. But after 13 minutes there is again accelerated pulse, irregular breathing, clouded vision and nausea. There is then improvement up to the 19th minute, when tachycardia and nausea appear. Following this there is general improvement, but complete return to normal only at the end of 2 hours. Parpanite is not suitable for electro-shock preliminary treatment. The action of (I) is upon several different parts of the nervous system, the peripheral, central and vagus systems. The muscular weakness produced by (I) responds only slightly to prostigmine. This differs from the action of curare (II), which acts on the striated fibers. Under the action of (II) a definite fatigue of the muscles results from repeated stimulation, but there is no total exhaustion as in the case of *myasthenia gravis* (III). Since (II) acts on the surface of the muscle this can be explained by supposing that in (III) there is a decrease in acetylcholine (IV), while under the action of (II) a normal amount of (IV) is present, but is acting on a smaller sensitive surface. The maximum action of (II) is reached in the 5–7 minutes after injection regardless of the size of the dose, but the duration is dependent on the dosage. H. O. SINGHER (Chem. Abstr.).

Effect of Cardiazole, Camphor, and Insulin on the Bioelectric Activity of the Cortex and Subcortical Formations of the Large Brain. Lisitsa, F. M., Sarkisov, S. A., and Sereiskii, M. Ya. (Brain Inst., Moscow). [*Byull. Eksptl. Biol. Med.*, **23**, 262–7 (1947).]

The effect of convulsants and insulin on bioelectric activity of frog brain was recorded by means of a Simons oscillograph with 3- and 4-stage amplification; subsequent changes in bioelectric action were related to various brain structures. Cardiazole or camphor produces a 4-phase action; after a short latent period in which all biocurrents are somewhat inhibited, a phase of wave discharges of greater amplitude occurs which corresponds to that characteristic for epileptic seizures. These waves originate in and are discharged principally by the cortex, but earlier

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and more intense discharges appear in the hypothalamus as compared with cortical activity. However, simultaneously with the biocurrent from cortex and hypothalamus, a discharge is observed in subcortical regions. At the conclusion of the group of bioelectric discharges the biocurrents seem to be exhausted earlier in the cortex. In the 3rd, post-seizural phase a slow wave appears with individual discharges; later (4th phase) bioelectric activity ceases. The changes characteristic of the 3rd and 4th phases are generated only in structures showing marked changes in potential (cortex). It is possible to detect a separate discharge wave in the subcortical region by selective extinction of bioelectric activity in the cortex. Large doses (unspecified) of convulsants induce small differentiated bioelectric discharges in the cortex and subcortical regions, which begin and end in each structure simultaneously; sometimes a stage of rhythmic activity is set up analogous to that found in narconal narcosis. Insulin produced 5-phase bioelectric brain action. It sometimes caused an initial weak increase in α-wave amplitude in spontaneous activity and particularly in reponse to various stimuli followed by a similar weak depression in cortical activity. A rhythmic slow fluctuation in the occipital lobe is also observed in the 2nd phase; in the 3rd phase the α-waves almost disappear from the biocurrent of the cortex, and slow oscillations predominate. In the 3rd and 4th phases (absence of α-waves) the threshold of response to light and tactile stimuli rises. Tactile irritation of the skin or irradiation of the eye provokes wave discharges in the subcortical region bioelectrically characteristic for epileptic seizure. Insulin sometimes provokes true epileptic attacks in the animals at this stage. In the 5th phase complete absence of bioelectric response to light and exteroceptor stimuli develops in both cortical and subcortical formations. The changes in biocurrent described are closely connected with a fall in blood sugar as much as 60–53 mgm. per cent. Intravenous glucose gradually restores bioelectric actions to normal. H. J. Oatfield (Chem. Abstr.).

Action of Phenamine on Conditioned Motor Reflexes in Monkeys (Macaca lapunder). Voronin, L. G., and Shirkova, G. I. [*Doklady Akad. Nauk S.S.S.R.*, **60**, 521–4 (1948).]

Phenamine (synthetic sympathicotropic alkaloid) administered at 0·03–3 mgm./kgm. level in 50 ml. of milk 40 minutes before the experiment, with a level movement by the monkey's hand as the response mechanism, showed repression of conditioned reflexes at doses over 0·18 mgm./kgm. and caused excitation in the animals. Since monkeys have a dead period in their conditioned reflex response in the middle of the night, experiments were also done in such a period; the drug removes the sleep condition, and in one specimen complete restoration of the reflex response was observed at 0·06 mgm./kgm. level, i.e. 5 times less than in man. The drug used at low levels, 0·12 mgm., appears to be optimum for the species, i.e., considerably lower than for man. The repressive action of large doses lasts for 24–48 hours. G. M. Kosolapoff (Chem. Abstr.).

Curare-like Action of Polymethylene Bis-quaternary Ammonium Salts. Barlow, R. B., and Ing, H. R. (Oxford Univ., Eng.). [*Nature*, **161**, 718 (1948).]

Tubocurarine chloride is a bis (tetrahydroisoquinoline) alkaloid containing 2 quaternary N atoms. Its potency in blocking neuro-muscular transmission might be due in part to the presence of two cationic groups at some optimal distance apart. Salts prepared were polymethylene bis(trimethyl-) and bis(triethylammonium) dibromides with chain lengths of from 2–5 and 7–13 C atoms. In the bistrimethyl series the C_2 member was about twice as active as the tetramethyl member. The salts with C_3, C_4 and C_5 were only feebly active, but there was a progressive rise in activity from C_7 to C_9. Activity remained constant from C_9 to C_{12} and fell off slightly at C_{13}. In the bistriethyl series activity rose steadily from C_4 to C_{13}. None of these compounds was more than 40 per cent. as active as the tubocurarine chloride. Rose Boyarsky (Chem. Abstr.).

Curare-like Action of Polymethylene Bis-quaternary Ammonium Salts. Paton, E. D. M., and Zaimis, E. J. (Natl. Inst. Med. Research, London). [*Nature*, **161**, 718–19 (1948).]

In the rabbit head-drop test for neuro-muscular block the potency of straight-chain aliphatic α,ω-bis-trimethylammonium iodides increased from the ethylene

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derivative to the octamethylene derivative. The decamethylene derivative was most potent, 0·1 mgm. per kgm. of the iodide being required to produce head-drop compared with 0·25 mgm. per kgm. of the d-tubocurarine chloride. The potency varied with the test object. Peculiarly, d-tubocurarine chloride was unaltered in potency when given after the bis-quaternary salts, but the converse was not true.

ROSE BOYARSKY (Chem. Abstr.).

Tetraethylpyrophosphate in Myasthenia Gravis. Burgen, A. S. V., Keele, C. A., and McAlpine, D. (Middlesex Hosp., London). [*Lancet*, **254**, 519–21 (1948).]

Tetraethylpyrophosphate (I) was an effective substitute for prostigmin (II) in 3 patients with myasthenia gravis. In a single injection of 0·5 per cent. solution in propylene glycol, (I) was approximately half as potent as (II), but its effect persisted twice as long. It was more cumulative than (II), but less so than diisopropyl fluorophosphate. When given by mouth, 10 mgm. of (I) was equivalent to 100–150 mgm. of (II). For oral administration a 2 per cent. or 5 per cent. solution in propylene glycol was diluted quickly with H_2O to prevent rapid inactivation of the drug by H_2O. The oral maintenance dose of (I) ranged from 8 to 12 mgm. daily, given in 2–3 doses. The side effects of (I) are similar to those of (II).

B. R. MURRAY (Chem. Abstr.).

Effects of Electroshock on the Concentration of Iron in the Blood Serum. Ferroni, A., and Indovina, I. (Univ. Catania, Sicily). [*Boll. soc. ital. biol. sper.*, **23**, 988–90 (1947).]

In 24 mental patients the concentration of Fe in the blood serum usually decreased after *grand mal* convulsions induced by electroshock, but increased when electroshock induced the *petit mal* type of response. W. M. S. (Chem. Abstr.).

Stable After-effects of Electric-shock Therapy. III. Effect of the Electrically Induced Convulsion on Some Phases of Mineral Metabolism in Schizophrenics. Serezhskii, M. Ya., and Lando, L. I. (Ministry Health, Moscow). [*Byull. Eksptl. Biol. Med.*, **24**, 355–9 (1948); *cf. ibid.*, **23**, 1 (1947).]

Before the shock treatment the average blood levels in a variety of schizophrenics were: 3·4 inorganic P, 11·5 Ca, and 17·5 mgm. per cent. K. Immediately after the electric shock inorganic P rose by 18, Ca rose by 13 and K rose by 8·2 per cent. One hour after the shock inorganic P fell somewhat below the normal level and K and Ca fluctuated considerably. After repeated shocks the results obtained are indistinguishable from the immediate after-effects of a single shock.

G. M. KOSOLAPOFF (Chem. Abstr.).

Paralysis of Nerves by Weichigelit (o-Tritolyl Phosphate Intoxication). Elsaesser, K. H. [*Deut. Gesundheitsw.*, **3**, 168–70 (1948); *Suddeut. Apoth.-Ztg.*, **88**, 162 (1948).]

Tritolyl phosphate, containing approximately 30 per cent. of the ortho isomer, is used in the production of Weichigelit. Cases of poisoning resulting from use of Weichigelit for shoes, bags and wrapping of food are described. o-Tritolyl phosphate can be eluted from the plastic and absorbed by the skin, causing nerve paralyses, especially in the extremities. EDWARD H. SHEERS (Chem. Abstr.).

The Point of Attack of Morphine on the Respiratory Center. Fischlewitz, J., and Bucher, K. [*Experentia*, **4**, 196–7 (1948) (*in German*).]

The brain stem of a rabbit was cut at about the middle of the pons. When morphine was applied to the caudal portion below the cut there was an increase in expiratory vagal reflexes. When it was applied above the cut area, nearer to the brain, or when it was given intraperitoneally, no augmentation of vagal reflexes was produced. The authors believe that the vagal reflex augmentation produced in normal animals by morphine is due to the action of morphine in removing an inhibiting effect located in the pons. C. RIEGEL (Chem. Abstr.).

The Pain-alleviating Action of Cobra Venom. Gessner, O., and Demuth, W. (Univ. Halle, Halle a S., Ger.). [*Med. Z.* (1), 62 (1944); *Chem. Zentr.*(1), 142 (1947).]

Cobra venom was found to be less satisfactory than morphine as regards the reliability and the rapidity of the pain-alleviating action. Nevertheless, its use

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alone or in combination with analgesic substances of the pyramidone series is recommended in those cases in which morphine or other opiates cannot be used or are poorly tolerated. M. G. MOORE (Chem. Abstr.).

Penicillin in the Cerebrospinal Fluid following Parenteral Penicillin. Boger, Wm. P., Baker, Richard B., and Wilson, Wm. W. (Philadelphia General Hosp., Pa.). [*Proc. Soc. Exptl. Biol. Med.*, **68**, 101–6 (1948).]

Penicillin concentrations above 0·03 units/c.c. were found in human cerebrospinal fluid following intermittent intramuscular injection of 100,000 units in aqueous solution. Caronamide increased the plasma levels of penicillin after doses of this size, and thereby increased the amount entering the cerebrospinal fluid. Caronamide itself entered the cerebrospinal fluid only at excessively high plasma concentrations (87–110 mgm./c.c.). L. E. GILSON (Chem. Abstr.).

Effects of Amphetamine and Cocaine on Neuromuscular Function. Luco, J. V., Eyzaguirre, C., and Perez, F. (Catholic Univ. of Chile, Santiago). [*J. Pharmacol. Exptl. Therap.*, **93**, 261–72 (1948).]

Cats anesthetized with nembutal were used in studying the effect of amphetamine (benzedrine) and of cocaine on action potentials of A fibers, on neuromuscular transmission and on the α waves of the A fibers. Amphetamine had a defatiguing effect during low-frequency stimulation, but it acted as a depressant during high-frequency direct or indirect stimulation (i.e. during intense activity of the contractile mechanism). It increased the response of denervated muscles to acetylcholine. It produced a contractile response in both normal and denervated skeletal muscles; since this response was not accompanied by action potentials, it was a contracture. Amphetamine had a tachyphylactic effect on blood pressure, but not on muscular response. During indirect muscle stimulation, cocaine, like amphetamine, acted to increase or decrease response. The same effect was produced when a denervated or fully curarized muscle was directly stimulated. Increased response seemed to be related to the development of contraction fatigue. Cocaine in small doses increased the response of denervated muscles stimulated by acetylcholine; large doses had a depressing effect. L. E. GILSON (Chem. Abstr.).

The Effect of Glutamic Acid on the Behavior of the White Rat. Hamilton, Hughbert C., and Maher, Eilleen B. (Temple Univ., Philadelphia, Pa., [*J. Comp. Psychol.*, **40**, 463–7 (1947).]

The effect of a 275 mgm. supplement of glutamic acid to the regular daily diet of white rats was studied. The test animals showed greater activity during the exploring period, but no other superior behavior on the Maier 3-table "reasoning" test. E. R. NEWTON (Chem. Abstr.).

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